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USEFUL PLANTS OF INDIA AND PAKISTAN

Second Indian Edition

A COMPANION VOLUME

MEDICINAL PLANTS OF INDIA

Based on the same lines as the present work, it will deal with medicinal uses of common plants of India and Pakistan. Full particulars as to uses, dosage, etc., will be given.

by

J. F. DASTUR, F.N.I.

(Indian Agricultural Service, Retired)

THE TREES OF INDIA
By C. McCann. 78 Coloured Plates

EVERYDAY GARDENING IN INDIA
By E. Crindal

GARDENING IN INDIA
By A. N. Bindal

ECONOMIC FRUIT GROWING IN INDIA
By R. A. Munshi

FERNS OF BOMBAY
By Prof. E. Blatter & Prof. J. D'Almeida

USEFUL PLANTS OF INDIA AND PAKISTAN

A Popular Handbook of Trees and Plants of Industrial, Economic and Commercial Utility

By

J. F. DASTUR, F.N.I.
(Indian Agricultural Service, Retired)

With 66 Illustrations

D. B. TARAPOREVALA SONS & CO. LTD.,
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INTRODUCTION

THIS great subcontinent of India and Pakistan presents such a range of climate, topography and geology that its flora too is enormously varied, and has an equally wide field of application. Even a cursory perusal of Sir John Watt's *Dictionary of Economic Products of India*—that masterly work in many volumes—would make the reader wonder about the vast wealth of flora that flourishes here.

The principal object of the present work is to give a glimpse of the riches possessed by this great region in its vegetable population. The inquisitive mind must quite often question the remote villager's use of the earth's produce. Does he make use of other fibres besides cotton for his domestic requirements? What vegetable dye stuffs does the village craftsman use for the toys, images, baskets, textiles, and the other manufactures, which he colours so beautifully? What timber is used in making the familiar things of daily use, such as furniture, carts, grain measures, oil-mills, musical instruments, combs, brush backs, etc.? What vegetable tanning materials can the villager get? Have the familiar plants other uses besides those for which they are commonly known? For example, has the ubiquitous *babul* no use but as firewood? Do the plants which bear the mango, banana, pineapple, pomegranate, and other delicious fruits only serve that purpose? Are weeds like *rui, agara, nagurmotha,* which run riot over waste lands, otherwise utterly useless? Answers to several such questions may perhaps be found in this book.

This small volume is entirely a compilation of information already available; necessarily therefore the matter is purely factual. It is hoped that it will awake the lay reader as well as the student of natural phenomena to new fields of potential interest. If any one gets from it an urge to look more deeply at the garden, field and forest open to him, this book will not have been published in vain.

The field to be covered is as vast as the subcontinent itself; and therefore compression and exclusion were essential to keep the volume within a reasonable size. Above all there is no attempt here to present a complete treatise of our useful flora. The following broad plan was therefore made:—

(1) to include only the flowering plants, and to exclude the

less familiar non-flowering plants, such as algae, fungi, lichens, etc.;

(2) to select from as wide a range as possible of both indigenous and exogenous plants so that various parts of the subcontinent might be covered;

(3) not to cover the medicinal properties of plants; a companion volume dealing especially with this aspect of our flora is proposed for later publication;

(4) to exclude the familiar varieties of plants which are commonly cultivated and which therefore naturally belong to the realm of agricultural and horticultural economy.

It follows that the choice of the plants described in this book did not have to be restricted only to those which have a wide distribution all over India and Pakistan. It has been possible to include plants which, though of narrow localization, have domestic or economic and commercial utility. This should give the lay reader a wide view of the wealth which our vegetable kingdom possesses; it should also stimulate his interest in the full range of our plants, even in the much despised weeds.

As far as possible technical terms have been avoided in plant descriptions to make identification easier for the lay reader; the aim has been to make reference to a glossary of botanical terms a rare necessity even for the most uninitiated. No originality is expected in describing a plant already known; so the writer of this book has made free use of descriptions already published, without modifications. In cases where a plant has been given a new nomenclature but is better known by its older name, and where different authorities use different names for the same plant the synonym of its technical name is given to make clear its identity. Local names and even English names are often misleading in identifying a species; the choice of local names is always problematical as the same plant gets different local names; even in the same locality one plant often masquerades under more than one name; conversely, a single local name may refer to more than one plant. Consequently the non-technical term does not always settle the plant's identity.

My grateful thanks are due to Rev. H. Santapau of St. Xavier's College, Bombay, and Dr. Mataprasad of the Royal Institute of Science, Bombay, for permitting me the use of their valuable libraries.

J. F. DASTUR

Bombay.

1. ABIES PINDROW ROYLE

Family: *Coniferae*

Local Names: Badar, paludar, rewari.

English Name: Himalayan Silver Fir.

Description: A large, evergreen tree, with a dense, cylindrical crown of dark green foliage; bark smooth on young stems, greyish-brown, deeply fissured vertically when old. Leaves in 2 rows, flattened, linear, 2-3 in. long, stiff, tip notched, underside with 2 silvery white lines. Male and female cones on the same tree. Mature cones ovoid, 4-7 in. long, nearly sessile, dark purple when ripe.

Distribution: The Himalayas from Chitral to Nepal at 7,500-10,000 ft.; Kurum Valley 8,000-11,000 ft.

Uses: The wood is soft, white or light brown, and light; it is not very durable but is highly prized for all internal work, such as planking, ceiling and floor wood; in the Himalayas it is in great demand for house-building; it is extensively used for railway sleepers, tea-chests, rough furniture, water troughs and general carpentry; it is also utilized for making wood-pulp.

2. ABROMA AUGUSTA LINN. F.

Family: *Sterculiaceae*

Local Names: Kumal, olak, tambol, ulatkambel.

English Names: Devil's Cotton, Perennial Indian Hemp.

Description: An evergreen shrub or small tree; branchlets, underside of leaves and inflorescence softly pubescent. Leaves membranous; the upper ovate or lanceolate, sometimes entire, about 6 in. long; the lower cordate, lobed and toothed, in a young tree. Flowers bisexual, in terminal or leaf-opposed cymes; sepals 1 in. long, persistent, pale green; petals whitish and dark purple, with purple hairs, terminating above in chocolate coloured, elliptic appendages, 1 in. long. Capsules membranous, 5-angled, 5-winged, 5-valved, 2 in. long. Seeds numerous and covered with silky hairs.

Distribution : A native of Malaya, but well established throughout the hot parts of India and Pakistan, from the Punjab to Sikkim up to an altitude of **3,000** ft., Khasi Hills, and Assam.

Uses : Economically the plant so far is very little known; from its bark is extracted a fibre, which is of great beauty, softness, durability and cheapness; it is similar in character, but superior, to jute and also sunn hemp. It can be readily used for the many purposes for which jute is in great demand these days. It can also be used as a substitute for silk. In Sumatra the dyed fibre is used as false hair. The retted fibre is made into fishing-nets in the Celebes.

✓ The hairs are irritant; the root bark has medicinal properties.

3. ABRUS PRECATORIUS LINN.

Family: *Leguminosae*

Local Names : Chanoti, gunchi, gunhjha, kunch, rakti, ratei.

English Names : Crab's Eye, Indian or Wild Liquorice.

Description : A branched, nearly glabrous twiner with a woody stem. Leaves pinnate, **4** in. long, axis terminating in a slender, short bristle; leaflets **16-40**, opposite, oblong; blade **0.75** in. long, membranous. Flowers in axillary, stalked, crowded racemes; axis irregularly thickened; calyx minute, silky; corolla rose-coloured. Pods thick, oblong, wrinkled, finely silky, **1-1.5** in. long. Seeds **3-6**, round, hard, bright scarlet or white with a black spot or white only.

Distribution : Throughout the plains of India and Pakistan, on the Himalayas and other hills up to an altitude of **3,000** ft.

Uses : This plant is best known for its seeds. They are used by jewellers as a unit of weight; each seed, on an average, weighs **1.75** grains, the weight being known as " ratty " or " ratei " weight. Finely powdered seeds are used to increase adhesion when soldering delicate ornaments. The seeds are used for making ornaments like bracelets, necklaces, rosaries, etc. The seeds ✓ contain the poison abrin which is made use of for poisoning cattle. The powdered seeds are made into a paste with water, and the paste is moulded into sharp " suis " or needles which are inserted under the skin of the animal. The seeds are also used for purposes of malingering.

A fibre is extracted from the stem; it is woven into baskets. The roots are used as a substitute for liquorice. In Jamaica the leaves are used as a substitute for tea.

The leaves, roots and seeds have medicinal uses.

4. ABUTILON AVICENNAE GAERTN.

Family: *Malvaceae*

Local Names: Jaya, jayanti, nahni khapat.

English Names: American Gall, Chinese Jute, Indian Mallow.

Description: An annual, herbaceous, hairy shrub. Leaves more or less cordate with a long point, 3-4 in. long; stalk, 3 in. long. Flowers solitary, axillary, stalked; petals yellow. Capsules with 15-20 segments; seeds many, hairy.

Distribution: A native of Uttar Pradesh (the United Provinces), Sind, and Kashmir.

Uses: It is known for the fibre it yields; in America the fibre has the reputation of being superior to jute and finer than Manilla hemp; jute cannot be bleached or dyed but this fibre can be readily dyed any colour; its natural lustre becomes prominent with aniline dyes.

5. ACACIA CATECHU WILLD.

Family: *Leguminosae*

Local Names: Kath, khaderi, khair, khair-babul.

English Names: Catechu Tree, Cutch Tree.

Description: A moderate-sized deciduous tree; bark dark-greyish brown, rough; branchlets dark-brown, glabrous, shining; spines short and hooked. Leaves twice pinnate, 4-6 in. long, pubescent; leaf-axis glandular; pinnae 10-12 pairs; leaflets 30-50 pairs, linear, sessile, glabrous. Flowers yellow in loose cylindric, simple or branched, axillary spikes, 2-4 in. long. Calyx and petals white-villous. Pods stalked, glabrous, strap-shaped, thin, 2-3 in. long, brown, shining, beaked at the apex, 3-10 seeded.

Distribution: Common in most of the drier parts of India and Pakistan, upto 5,000 ft. in the Himalayas and Sikkim.

Uses: The wood is dark or light red, turning brownish-red with age, very hard, durable, takes a fine polish, and resists white ants. The wood is used for house-posts, boat-building, wells, cart construction, agricultural implements, bows, tool handles, sword handles, rice-pestles, oil- and sugarcane-mills, clod crushers, hookah stems, flutes, etc. The heart-wood is a very important source of vitamin P; it contains the highly active catechin, *l*-epicatechin. The wood is very highly prized as firewood, especially by goldsmiths; it is one of the best woods for making charcoal.

From the wood are obtained three articles of commerce, *viz.*, cutch, kath and kheersal. The first two are catechu or Terra japonica of commerce, and are obtained by boiling the softer parts of the wood. The active astringent principles in both are catechin and catechu-tannin; cutch is dark but kath is pale as most of the tannic acid has been removed from it. Cutch is a valuable dye in industries. It is extensively used in dyeing cotton, canvas for boat sails, and silk, and in calico-printing. It produces permanent shades of brown colour; fishermen value cutch for dyeing and preserving their fishing nets. It is also used in the process of rot-proofing jute. However as a tan it does not hold a high position as it stains the skin.

Kath has extensive medicinal uses and is almost universally used with pan or betel-leaf. In some restricted parts of India the red expectoration from chewing pan is collected and used as an auxillary in dyeing *eri* silk. Chemically kath is purer than cutch.

In the cavities of the wood is sometimes present a pale crystalline substance, known as kheersal; it is highly valued in indigenous medicine.

A sweet, pale yellow gum exudes from the tree; a pale coloured mucilage is made from it by dissolving it in water. The gum is considered as one of the best substitutes for the true gum arabic.

The tree is a host for lac insects.

6. ACACIA CONCINNA DC.

Family: *Leguminosae*

Local Names : Ban-ritha, kocho, ritha, shikekai.

Description : A large, stout, prickly, climbing shrub; branches smooth, grey, shining, densely covered with small, white spots, and armed with hooked, grey prickles. Leaves twice pinnate 2-4 in. long; leaf-axis angular, covered with hooked, brown-pointed prickles, having a few glands. Pinnae 8 pairs or more; leaflets more than 20 pairs, linear, glabrous. Flowers yellow in dense, panicled, globose heads. Pods shortly stalked, linear-oblong, 3-5 in. long, thick, fleshy, red, dehiscent when quite dry, 6-10 seeded.

Distribution : Tropical jungles throughout India.

Uses : The pods are the most useful part of the plant. They are in great demand, like soapnut (*Sapindus trifoliatus*), as a detergent for washing the head, and silk and woollen fabrics. Jewellers employ them for cleansing tarnished silver plate. A decoction of the pods serves as an insecticide for killing lice and vermin, as a hair tonic, and as a remedy for dandruff. A paste made from the pods is used for marking the forehead.

The bark is used for dyeing and tanning fishing-lines. A beautiful green dye is obtained from the leaves with turmeric. The leaves and pods have medicinal uses.

7. ACACIA FARNESIANA WILLD.

Family: *Leguminosae*

Local Names : Divana babul, gandila babul, kikar, wilayati babul, wilayati kikar.

English Names : Cassie, Scented Babul, Sponge Tree.

Description : A thorny, erect shrub; bark light-brown, rough; branches covered with minute, pale-brown dots. Leaves twice pinnate; pinnae 4-8 pairs; leaflets 10-12 pairs, minute, glabrous, leathery. Flowers minute, bright yellow, highly sweet scented, in small, globose, clustered heads. Pods turgid, cylindric, pointed at both ends, glabrous, brown, 2-3 in. long; seeds in 2 rows, embedded in a dry, spongy tissue.

Distribution : A native of America but naturalized or cultivated all over the world.

Uses: The plant is best known for the well-known cassie perfume, distilled from the flowers. Cassie absolute is employed in the preparation of a number of violet bouquets; it is extensively used in European perfumery. In Uttar Pradesh (the United Provinces) and the Punjab cassie pomades were manufactured at one time.

The bark is used for tanning and dyeing leather black in combination with iron ores and salts. The pods also contain a tannin, a glucoside of ellagic acid, and are used for tanning leather. In Bengal and the West Indies they are used for the black leather dye. A gummy substance is obtained from the pods which is used in Java as a cement for broken crockery. The gum exuding from the trunk is considered superior to gum arabic in the arts.

The bark, leaves, roots and the gum have medicinal uses.

8. ACACIA LEUCOPHLOEA WILLD.

Family: *Leguminosae*

Local Names: Arinj, hiwar, nimbar, reonj, reru, safed babul, safed kikar.

English Name: Reunja.

Description: A moderate-sized or large tree; bark grey and smooth when young, dark brown and rough when old. Spines straight, up to 1 in. long. Leaves 1-2 in. long; pinnae 5-15 pairs; leaflets linear. Flower heads pale yellowish-white, in large, terminal panicles. Pods flat, strap-shaped, 4-8 in. long.

Distribution: Plains of the Punjab, Rajasthan, and in the forests of Central and Southern India.

Uses: The wood is light red to brick red ageing to reddish brown; it is used for posts, agricultural implements, oil-mills, carts and cart wheels and turnery. It makes excellent fuel.

The bark yields a strong fibre; it is much used for fishing-nets and ropes. The bark is employed in the making of spirits from sugarcane and palm juice; it flavours the spirits. It is also locally utilized as a tan and as a dye; it gives black colour. In times of scarcity a mixture of the powdered bark and bajra is used as food.

The leaves also are used as a black dye. Young pods and seeds are edible. The tree yields a gum, which serves as an adulterant of the "gum ghati" of commerce.

9. ACACIA PENNATA WILLD.

Family: *Leguminosae*

Local Names: Aila, arar, awal, biswul, shemba.

Description: A large, very prickly, glabrous, shining, scrambling or climbing shrub; bark reddish brown; young parts pubescent. Leaves bipinnate, 4-6 in. long; leaf-axis covered with fine down and a few glands; pinnae 8-20 pairs; leaflets 30-50 pairs. Flowers white or pale yellow, in stalked heads, less than 0.5 in. diam., single or in clusters of 2-4, axillary. Pods stalked, 4-8 in. long, straight, strap-shaped, brown or yellow, sutures thickened; seeds 8-14.

Distribution: Sub-Himalayan tract from Kumaon to Sikkim, Bihar, East Bengal, Western and Southern India.

Uses: The bark and the pulp of the fruit are used for tanning fishing-nets and as a fish poison. In South Africa a long, strong fibre is extracted from the stem; it is used for making fishing gear, cordage, etc.; the charred fibre is utilized for cleaning mirrors; twigs and roots serve as tooth brushes; they are also used for cleaning beads and ornaments.

The bark and roots are used medicinally.

10. ACACIA SCORPIOIDES A. CHEV.

Syn. Acacia arabica Willd.

Family *Leguminosae*

Local Names: Babli, babola, babul, kikar.

English Name: Babul Tree.

Description: The tree is better known by its old name *Acacia arabica* Willd. A medium-sized tree; bark dark-brown, rough, longitudinally fissured; branches zig-zag, grey-downy when young; spines straight, white, often with brown points, sharp, up to 2 in. long. Leaves twice pinnate; leaf-axis 2-4 in. long, downy, with cup-shaped glands; pinnae 4-9 pairs, up to 1.5 in. long; leaflets 10-20 pairs, very small, glabrous or downy, membranous, linear-oblong. Flowers golden yellow, fragrant, crowded in long-stalked, globose heads. Pods solitary, stalked, 3-6 in. long, compressed, deeply indented between the seeds, leathery, densely grey-downy, 8-12 seeded.

Distribution : Indigenous in Sind, Gujerat, Rajasthan and northern Deccan; but spread all over India; on the hills generally confined to lower elevations.

Uses : It is one of the most useful trees of India and Pakistan. The young plant is used by the cultivator for fencing his fields; the sapling provides poles and posts for his huts; leaves and pods supply fodder for his cattle. The timber has a number of domestic and agricultural uses; it is one of our durable hardwoods; it is pinkish-white to light red at first, later turning reddish-brown; it is considerably resistant to white ants. It is used for making beams, rafters, door-frames, yokes, agricultural implements, bodies of carts and carriages, axles, spokes, felloes, solid wheels, Persian-wheels, well-curbs, helves, hookah stems, dies for cloth stamping, anvil blocks, gymnasium equipment, such as Indian clubs, dumb-bells, malkhamb, etc. In the northern and western parts of India and Pakistan the wood is in great demand for constructing boats. The wood is also much valued as fuel; it makes very good firewood and charcoal.

Babul bark is highly prized as a tanning material and is one of the most extensively used tanning barks. The tannage is considered as equal to old English tannage. It is equally suitable for the production of heavy and dressing leathers; it is mainly used for sole and harness leather tanning. The bark is also used for dyeing cloth dark brown. In some places it is extensively used in the manufacture of rum and country liquors. The bark from young branches is considered suitable for making paper pulp.

Babul pods contain a high percentage of tannin; the tannin contents of the deseeded pod are 18-27 per cent., and of the entire pod 12-14 per cent. The pods produce organic acids by fermentation; hence their value as a tanning material. Crushed pods give a buff colour to leathers, and on boiling yield a black colour, " syah bhura "; these colours are fast. The pods are also used for removing lime from hides before they are tanned, for dehairing skins, and in the manufacture of tooth powders and ink. The juice of the pods coagulates rubber latex.

The leaves are used occasionally in dyeing, and often in the manufacture of ink. As a tan they are useless because of their low tannin content. They also serve as an ingredient of the preparation known as "madak," which is made from the intoxicating drug, Indian-hemp.

Babul twigs are extensively used as tooth brushes or chew-sticks. The green twigs are made into baskets, which are strong and durable. They are also used for making fishing-traps. In Assam and Bengal bundles of these twigs are used as decoys by fishermen. In the Punjab a fibre is extracted from the slender twigs for the manufacture of paper; the fibre is also used for making coarse ropes.

The spines serve as fishing hooks and paper pins.

The bark of the roots is employed to flavour country liquor and as an adjunct in the fermentation of sugar.

The tree exudes a gum, known as "gum ghati"; it is of great use in calico-printing and dyeing, sizing silk and cotton, fixing paint and white-wash, making paper, matches and inks, and as a mucilage. It is also highly nutritive and is much used in the preparation of sweets.

The bark, leaves and pods are extensively used in indigenous medicine.

11. ACACIA SENEGAL WILLD.

Family: *Leguminosae*

Local Names: Kher, khor, khor-ka-khor, kumta.

Description: A medium-sized spiny tree, with flexuose, downy, grey branches; spines small, hooked. Leaves pinnate, up to 1 in. long; leaf-axis, finely downy, with 2 glands; pinnae 6-10; leaflets small 16-28, rigid, leathery, glabrous, pale, glaucous-green. Flower spikes, 2-3 in. long, not very dense; calyx bell-shaped, glabrous, deeply toothed; corolla yellowish. Pod straight, strap-shaped, 3 in. long, thin, grey, firm, indehiscent, 5-6 seeded.

Distribution: Found in Rajasthan, Sind and Las Bela.

Uses: The tree yields the valuable true gum arabic of commerce; it has several uses; it is not only extensively used in pharmaceutical preparations but is also much used in the manufacture of ink, blacking and confectionery, in dyeing of cloth to give lustre to silk and crepe, for thickening colours and mordants in calico-printing. It is also mixed with pigments for pottery.

Strong ropes are made of the fibre extracted from the bark. The wood can be utilized for making tool handles.

12. ACHRAS ZAPOTA LINN.

Family: *Sapotaceae*

Local Names: Chiku, sapota.

English Names: American Bully, Sapodilla Plum, Tree Potato.

Description: A handsome, middle-sized, evergreen tree; bark dark-grey; young shoots covered with tawny-tomentum. Leaves crowded near the ends of branchlets, shining, leathery, elliptic-oblong or oblong-lanceolate, glabrous, 3-6 in. long. Flowers solitary, axillary, long-stalked, whitish; calyx tawny-tomentose, sepals 6; corolla slightly longer than calyx, lobes 6. Fruit a berry, globose or ovoid; skin rough, brown, thin; seeds 5 or more, shining, embedded in a tawny, sweet pulp.

Distribution: Indigenous in tropical America; widely cultivated in India and Pakistan.

Uses: The tree is valued for its delicious fruit. The milky juice or the latex, the "chicle" of commerce, is much used in the manufacture of chewing gum and as a cement for joining small articles and in dental surgery. In the Philippines it is used for dyeing boat sails and tanning fishing-tackle.

The bark is used as an astringent, tonic and febrifuge.

13. ACHYRANTHES ASPERA LINN.

Family: *Amarantaceae*

Local Names: Agara, apamarga, apang, chirchira, lacjira.

English Names: Prickly-chaff-flower, Roughchaff Tree.

Description: A tall, erect, much branched, ash-coloured shrub, about 3 ft. high. Leaves velvety tomentose, up to 4 in. long, opposite, entire, variable in shape. Flowers bisexual, in slender, long, simple and branched spikes, reaching up to 18 in. in fruit. Bracts membranous, spinescent, persistent. Perianth hardened, of 4-5 rigid segments.

Distribution : A common weed throughout India and Pakistan.

Uses : The ashes of the plant are known in Sanskrit as " apamarga," and are used as an alkali in dyeing and for washing clothes. The leaves are ordinarily used as a pot herb; in Rajasthan the seeds are eaten in days of scarcity.

The plant has many medicinal properties.

14. ACORUS CALAMUS LINN.

Family: *Araceae*

Local Names : Bacha, gorbach, shadgranth.

English Name : Sweet Flag.

Description : An aromatic, erect, marsh herb; root-stock thick, creeping. Leaves in 2 rows, tufted, 1.5-3 ft. long. Spathe leaf-like, 6-30 in. long, not enclosing the spadix. Spadix sessile, 2-4 in. long, cylindric, dense-flowered. Flowers bisexual, yellow-green; perianth of 6 segments. Berries yellow-green, angular, 1-3 seeded.

Distribution : Throughout India and Pakistan in marshes and on river banks; wild or cultivated up to 8,000 ft. on the Himalayas.

Uses : The plant is aromatic on account of the presence of an essential oil, which contains the glucosidic bitter principle, acorin; it also contains the phenolic ether, asarone, but in commercial varieties of the plant asarone is present only to the extent of 7 per cent., whereas in our indigenous variety it is present up to 80 per cent., terpenes and equiterpene derivatives being in very small quantities. The leaves and the root-stock are used in perfumery, in the preparation of hair powders, and for flavouring liquors, beer, gin, vinegar, snuff, and various other preparations. The " bach " of commerce, which has many medicinal uses, is prepared from the root stock. The leaves and the root-stock make very effective insecticides for use against biting and sucking insects attacking field crops, stored grains, woollens, and against household pests, like bed bugs, fleas, flies, etc.; to make the insecticide either the leaves or the root-stocks are finely powdered to be used as a dust, or an aqueous solution is made of them to be used as a spray.

The fresh root-stock is used in confectionery and also as a substitute for ginger.

The plant has many medicinal uses.

15. ADANSONIA DIGITATA LINN.

Family: *Bombacaceae*

Local Names: Gorakh amli, gorakh chichi, goramlichor.

English Names: African Calabash, Baob Tree, Monkey-bread Tree.

Description: A fantastic looking tree with a short trunk of considerable size close to the ground and tapering rapidly upwards; bark smooth, greyish. Leaves digitate, deciduous; leaflets 5-7, glabrous, downy beneath, 3-4 in. long, obovate or oblong-lanceolate, entire or sinuated at the margins. Flowers white, solitary, axillary, pendulous on a long stalk; calyx cup-shaped, thick leathery, 5-lobed; petals 5; staminal tube short, thick, cylindrical, divided into numerous filaments above. Fruit pendulous, oblong, woody, downy, indehiscent, 8-12 in. long. Seeds immersed in a mealy substance.

Distribution: Indigenous in Africa, but naturalized all over India and Pakistan.

Uses: The wood is pale-yellow, soft and very light; it is made into rafts to support men in tanks; it is used for making brown paper. Some of the African tribes use the hollowed trunk as a coffin; it is reported that it has the property of mummifying the corpse placed in it without being embalmed.

A fibre is extracted from the inner bark; it is indestructible and is converted into cordage of very good quality and into coarse thread which can be woven into cloth. This fibre also makes strings for musical instruments. The powdered bark and leaves are used as a condiment in place of salt and pepper; they are supposed to be cooling and useful for checking perspiration. The tender leaves are used as a pot herb.

The fruits also have many uses. They are used by fishermen as floats for their nets. The ashes from the woody shell of the fruit, the seeds and the bark are used as potash manure; mixed with rancid palm-oil these ashes make an excellent soap. Beads are made out of the seeds. Potters employ the seeds to smooth earthenware before firing. The acid pulp of the fruit coagulates rubber latex, curdles milk, and also makes a good beverage. The pulp is useful as a fumigant that keeps off biting insects from domestic animals.

An infusion of the leaves and flowers and the gummy exudation from the bark have medicinal uses. The bark is used as a substitute for quinine.

16. ADENANTHERA PAVONINA LINN.

Family: *Leguminosae*

Local Names: Bari gumchi, kunchandana, lal chandan, rakta chandan, rakta kambal, val.

English Names: Bead Tree, Coral Pea, Peacock Tree, Red Wood Tree.

Description: A large, deciduous, unarmed tree, bark rough, dark grey. Leaves twice pinnate, dark green, 1-2 ft. long; pinnae opposite, 4-6 pairs; leaflets 12-20, alternate. Flowers scented, pale-yellow coloured, in short stalked racemes, 2-6 in. long. Pods, linear, curved, twisted when opening, 6-9 in. long. Seeds 10-12, bright scarlet, shining.

Distribution: A native of most of the warmer and moist parts of India and Pakistan.

Uses: The wood is deep red, very hard, heavy, fibrous and durable. It is used for house building and cabinet making. The red dye extracted from the wood is very often used as a substitute for the dye obtained from Red Sandal Wood (*Pterocarpus santalinus*). The powdered wood is made into a paste, which is used by Brahmins as " tilak " for marking their foreheads.

The seeds are convex on both sides, hard and a beautiful bright scarlet; they are used as beads for rosaries, and as weights by jewellers and goldsmiths, the weight of each being approximately 4 grains. The powdered seeds mixed with borax and water make a very useful cement. The gum known as " madatia " is obtained from the tree.

The seeds and the wood are used in indigenous medicine.

GIRLS COL

17. ADHATODA VASICA NEES.

Family: *Acantaceae*

Local Names: Adhatodai, adsale, arusha, rusa, vasaka.

Description: A gregarious, evergreen, densely branched shrub; bark smooth, ash-coloured; branches softly hairy. Leaves opposite, elliptic, pointed at both ends, entire, minutely pubescent, 5-8 in. long. Flowers white with red spots and streaks in axillary, stalked, bracteate spikes, 1-3 in. long; bracts leafy, 1-flowered; calyx deeply divided into 5 lobes, pubescent; corolla 2-lipped, pubescent outside; upper lip notched, curved; lower lip 3-lobed. Capsules clavate, pubescent, 4 seeded.

Distribution: Common in tropical India from the Punjab to Southern India.

Uses: It is one of the plants grown for reclaiming waste lands; because of its foetid scent it is not eaten by cattle or goats.

The wood makes very good charcoal for gunpowder; it is used as fuel for brick-burning. The ashes are employed by " dhobis " in place of " sajji," crude carbonate of soda, for washing clothes. In Bengal beads are made out of the wood. The stems and twigs are used as supports for mud-wells. The twigs and leaves are used as a green manure in rice fields.

The leaves on boiling in water give a durable yellow colour which is used for dyeing coarse cloth and skins; in combination with indigo the cloth takes a greenish blue or a beautiful dark green colour. The leaves are utilized in the making of the special preparations known as " kabis " with which unglazed pottery is washed or painted, before it is fired, to impart to it a particular black colour. In agriculture the leaves are not only used as a green manure in rice fields but they are also used as a weedicide, insecticide and fungicide. They contain the alkaloid, vasicine. As a weedicide they are used against aquatic weeds in rice fields; as an insecticide they are used in the same way as tobacco leaves; as a fungicide they prevent growth of moulds on fruits which are covered by vasica leaves. Market gardeners place layers of these leaves on fruits, like mangoes, plantains, custard apples, which have been picked in an immature state to hasten ripening and to ensure development of natural colour of these fruits.

The plant has many medicinal uses.

18. ADINA CORDIFOLIA BENTH. & HOOK. F.

Family: *Rubiaceae*

Local Names: Haladya, haldu, karam, kurmi.

Description: A large deciduous tree, often buttressed; bark about 0.5 in. thick, grey, soft; young parts pubescent. Leaves cordate-orbicular, pubescent beneath, leathery, 4-12 in. long; leaf-stalk thick, pubescent, 3-4 in. long. Flower heads stalked, yellow, about 1 in. diam.; stalk 2-4 in. long, 1-3 from one leaf axil; flowers densely pubescent. Fruit-head a collection of numerous, very small capsules.

Distribution: In deciduous forests throughout the moister regions of India and Pakistan, and in the Sub-Himalayan tract up to 3,000 ft. high; common in Western India.

Uses: The freshly cut wood is yellowish, but later it turns reddish-brown; it is moderately strong and takes a good polish. It is suitable for internal fittings of buildings, but not for external work; it is used for canoes, dugouts, planking of river boats, packing cases, cigar boxes, sieve frames, furniture, yokes, toys, gunstocks, drums, tom-toms, pen holders, handles for brushes, mirrors and knives, grain measures, agricultural implements, rulers, snuff boxes, fret-saw work, boot trees, cement barrels, carving, picture frames, etc.; it is in great demand specially for making best quality combs and bobbins; stubbing tubes, skewers, and rover tubes made out of this wood are as good as the imported ones made out of beech (*Fagus sylvatica*); " haldu " is one of the best of our timbers suitable for flooring, and panelling railway carriages; recently it has been shown that the wood is suitable for battery separators.

The plant contains a bitter principle; its juice is often used to kill maggots in sores.

19. AEGLE MARMELOS CORR.

Family: *Rutaceae*

Local Names: Bael, bilva, siriphal.

English Names: Bael Tree, Bengal Qunice.

Description : A moderate sized, deciduous tree, usually armed with axillary, straight, strong spines, 1 in. long; bark thick, soft and grey coloured. Leaves usually tri-foliate, alternate, glabrous, stalk not winged; leaflets oblong, crenulate, membranous. Flowers bisexual, in short, lateral panicles, greenish-white, fragrant; calyx pubescent; petals 4-5, oblong, leathery, gland-dotted; stamens numerous. Fruit woody, usually globose, smooth, grey-yellow or greenish, 2-6 in. diam.; seeds numerous, densely clothed with fibrous hairs, embedded in a thick, sweet aromatic, orange-coloured pulp.

Distribution : Throughout India and Pakistan; Sub-Himalayan tract from the Jhelum eastwards along the foot hills; common in Madhya Pradesh (the Central Provinces).

Uses : The wood is yellowish or greyish-white, hard, lustrous, aromatic when freshly cut; it takes a fine polish and is suitable for house-building, cart-construction, agricultural implements, carving, oil- and sugar-mills, pestles, tool handles, combs, etc.; but the tree is too valuable to be felled for its timber.

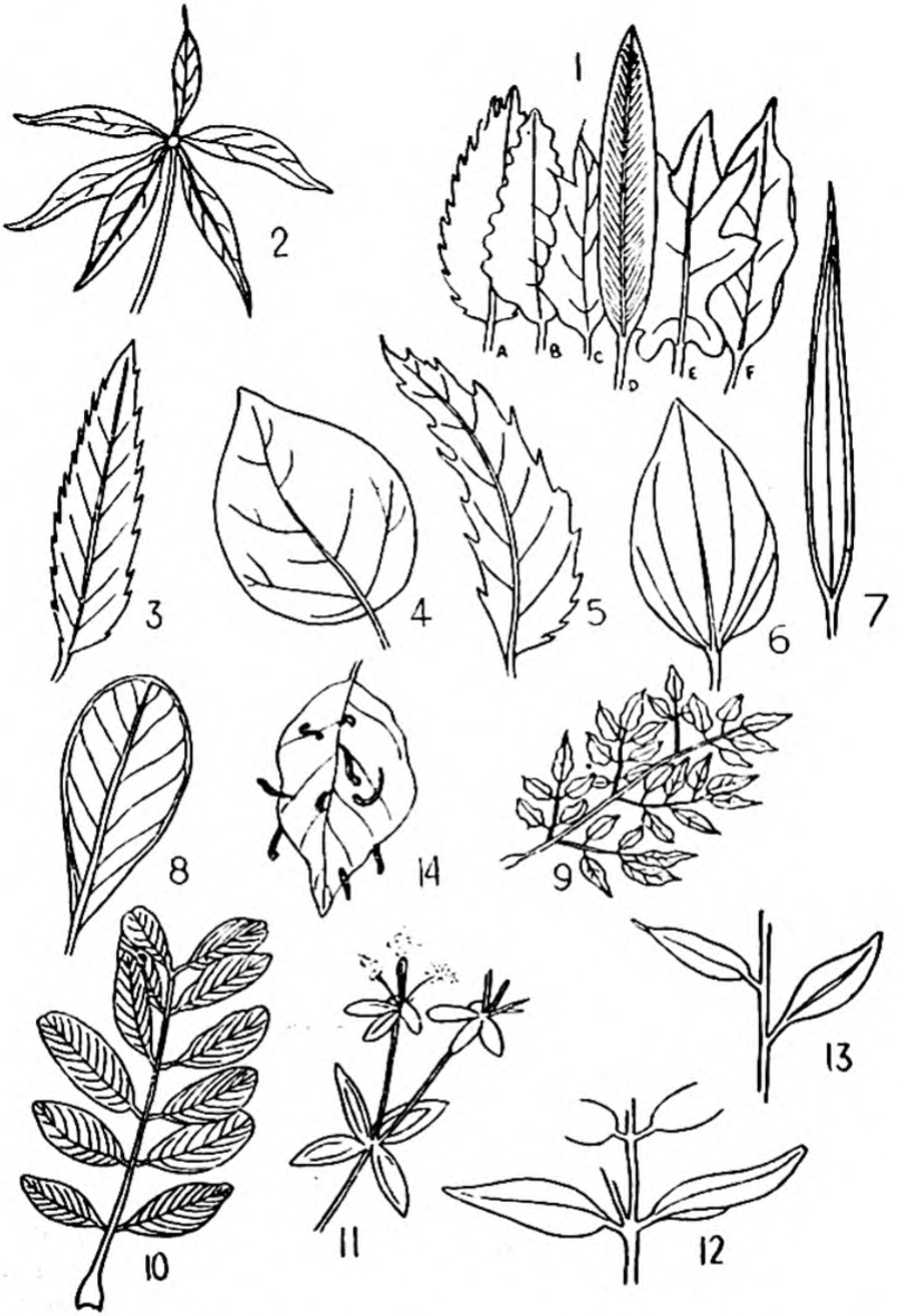
The twigs and leaves are used as fodder. The twigs are also used as tooth brushes or chew-sticks. A sweet-scented water is distilled from the flowers.

The most valuable part of the tree is the fruit. A yellow dye is obtained from the unripe rind which is used with myrobalans in calico-printing. In Siam the shell is used for scenting hair oil. On distillation the rind yields the essential oil known as "marmelle oil." The sweet aromatic fruit pulp is very nutritious; it is used for making sherbet. Mixed with lime the pulp makes a tenacious cement, which is very much used for the construction of wells; it is also employed as a varnish where a polished surface is required. The pulp is often used as a substitute for soap for washing clothes, as it has detergent properties.

The gum that exudes from the bark makes a good adhesive paste.

The tree is one of the sacred trees of the Hindus; the leaves are used as offerings to deities.

Almost every part of the tree is used in indigenous medicine.



1, Simple leaves with margins: (A) serrate, (B) crenate, (C) dentate, (D) entire, (E) lobed, (F) wavy. **2**, Leaf digitate compound. **3**, Leaf elliptic. **4**, Leaf cordate. **5**, Leaf oblique. **6**, Leaf ovate. **7**, Leaf lanceolate. **8**, Leaf obovate. **9** and **10**, Compound leaves, twice pinnate and once pinnate. **11** to **13**, Leaves whorled, opposite and alternate. **14**, Leaf with galls.

GIRLS COLL

20. AESCHYNOMENE ASPERA LINN.

Family: *Leguminosae*

Local Names: Benda, bhat-sola, pani-kuhila, phul-sola, sola.
English Name: Pith Plant.

Description: A tall, soft, perennial shrub, up to **10** ft. high. Stem stout, pith-like. Leaves odd-pinnate; leaflets numerous. Flowers large, yellow, in axillary racemes. Calyx deeply 2-lobed; stamens **10**, in **2** bundles. Pods up to **2.5** in. long, jointed, constricted opposite the seeds.

Distribution: In tanks and lakes throughout Sind, Bengal, Assam and South India.

Uses: The useful part of the plant is the pith-like stem. It is converted into fishing-floats and rafts, swimming-belts, plugs for bottles, lining of tops of palanquins. It is extensively employed in the manufacture of sun-hats, marriage crowns, called " mukut," for Hindu brides and bridegrooms, " shera," the bridal veil of Muslims, children's toys, decorations for images such as " chhar," " jhulan," " rahan," models and similar other articles. It has its uses in surgery for widening the opening of a sinus or abscess, and ear-ring holes in the ears, and as a substitute for surgical lint. It serves as a good insulator, being a bad conductor. In olden days it was much in demand as tinder.

The leaves are sometimes used as a pot herb.

21. AESCHYNOMENE INDICA LINN.

Family: *Leguminosae*

Local Names: Kat sola, kuhilia.

Description: A slender, glabrous, much branched, annual undershrub. Stem erect, **1-3** ft. high. Leaves odd-pinnate; leaf-stalk glandular; leaflets numerous, minute, sensitive, alternate, narrowly oblong. Flowers yellow, may be streaked with purple, in numerous, axillary, glandular racemes; calyx 2-lipped. Pods stalked, smooth, flat, **1-1.5** in. long, indented on one side, indehiscent, **7-9**-seeded.

Distribution: Throughout India and Pakistan upto **5,000** ft.

Uses: The stem is not as soft as that of " sola " (*Aeschynomene aspera*); it is known as " hard sola," and can be used for most of the purposes for which " soft sola " is employed. It is chiefly used for making sola-hats, floats for fishing-nets, fishing-baskets and fishing-rafts, being cheaper than "soft sola." It is also utilized as supports by people for crossing rivers, and for making " gadis " or elephant pads. Charcoal from this plant is in demand for making gun-powder and fireworks. The wood is also employed as fuel for firing pottery.

22. AGAVE AMERICANA LINN.

Family: *Agavaceae*

Local Names: Bara kanwár, nam kanta, rakas-pattah.

English Names: American Aloe, Century Plant.

Description: A stout, shrubby plant; trunk short, bearing a rosette of leaves. Leaves lanceolate, 60-80 in. long, 6-8 in. broad, smooth, grey, ascending without curved ends, with a terminal, rather short, stout, recurved, round-grooved spines, obliquely flattened at base and moderately large, grey prickles on prominent, marginal elevations. Inflorescence 20-30 ft. long, rather slender; flowers 2.5-2.75 in. long.

Distribution: A native of America, but naturalized throughout India and Pakistan.

Uses: The plant is best known for the excellent fibre known as " pitta " thread contained in the leaves and roots; it is very durable; ropes and cordage made out of it are considered to be superior to those made out of hemp; they are used for lashing calico bales, and as log-lines for ships; the fibre is also used for making mats, sacking, etc.

There are a few other uses of the leaves; an extract of the leaves is used like soap to make lather; they contain a volatile oil; wall paper and plasters are said to be rendered white ant proof if they are impregnated with the leaf juice and pulp; the leaves are used as a strop for sharpening razors on; a strong, fiery beverage, called " mescal," is made from the roasted leaves; the dried leaves are also used as a substitute for tobacco in smoking.

The sour sap exuding when the central bud is lopped at the flowering season is made into a beer, the " Pulque beer " by Spaniards by fermentation; by the distillation of the sap the brandy known as " Mexical " is produced; sugar and vinegar can also be made out of the sap.

In times of scarcity the flowering stock and the pulp of the lower part of the leaf are used as food. The dried flower-stalk is used for thatching, and its slices as a razor strop.

The plant is useful as a fish poison.

23. AGAVE SISALANA PERR.

Family: *Agavaceae*

Local Names: Bans kawara.

English Name: Sisal Hemp.

Description: A shrub with a very short and stout trunk bearing a rosette of leaves. Leaves thick, fleshy, 30-60 in. long, 4-6 in. wide, terminating in a dark chestnut coloured, grooved, thick spine, 0.75-1 in. long. Flower-stalk 10-25 ft. high, with raher slender, ascending branches, bearing at the forked ends erect clusters of yellow flowers. Flowers developing into bulbils and not in seed pods. The plant dies after developing flowers and bulbils.

Distribution: A native of Central America; naturalized in the warmer parts of India and Pakistan.

Uses: The valuable part of the plant is its leaves from which is extracted a fibre of great commercial value; at one time the fibre was used extensively for making binder twine, but now more use is made of this fibre as it is considered a satisfactory substitute for Manila fibre; it is therefore used for manufacturing heavier twine, ropes and marine cordage; it is at times used as a substitute for jute, and is woven into mats, rugs and fabrics for making sacks for coffee, waggon covers, floor covering, etc.; other uses to which the fibre is put to are in the making of mops, brushes, kraft paper, paper board, etc. Cheap twines and upholstery tow are made out of sisal waste.

The sap exuding from the cut end of the flowering stalk is sweet; "Pulque" beer of the Spaniards is made by fermenting this sap, and "Mexical," a kind of brandy, is manufactured by distilling this sap.

24. AILANTHUS EXCELSA ROXB.

Family: *Simarubaceae*

Local Names: Maha nim, maha rukh.

English Name: Tree-of-Heaven.

Description: A very lofty, beautiful tree, with large branches, and rough, light-grey, angular bark. Leaves alternate, pinnate, up to 3 ft. long, covered with fine hairs when young, glabrous when old; leaflets 8-14 pairs, nearly opposite, falcate-lanceolate, unequal sided, coarsely toothed, often lobed, 4-6 in. long. Flowers small, white or yellowish, unisexual and bisexual on the same plant, in axillary, much branched panicles. Fruit winged, red-coloured, twisted at the base, 2 in. long, 1-seeded.

Distribution: Indigenous in Central and Southern India, Bihar and Western Peninsula.

Uses: The wood is soft, yellowish-white, and lustrous when fresh, turning greyish-white with age, light and fairly strong. It is employed for making fishing-floats, sword handles, country boats, catamarans, cigar boxes, toys, drums, packing cases, and spear-sheaths. The wood has been found to be suitable for match-sticks but not for match-boxes.

The bitter and aromatic leaves, the bark, and the gum from the stem are of medicinal value.

25. ALANGIUM SALVIIFOLIUM WANG.

Family: *Alangiaceae*

Local Names: Akola, ankora, ghaul, koeli, onkla.

Description: A straggling shrub or small tree, nearly evergreen, with or without thorns; bark thick, greyish. Leaves alternate, short-stalked, oblong or lanceolate, slightly hairy, 3-6 in. long, membranous, entire. Flowers in clusters, greenish-white, scented; flower-stalks and calyx hairy. Petals varying in number, usually 6, about 1 in. long, yellowish-white, hairy outside, stamens many. Fruit ellipsoid, smooth, pubescent, 0.75 in. long. Seed 1, large, embedded in a soft pulp.

Distribution: Sub-Himalayan tract from the Saharanpur

Siwaliks to Nepal, Gangetic Plain, Bengal, Bihar, Madhya Bharat, Rajasthan, and the drier regions of the Peninsula.

Uses: The wood is olive-brown in colour, aromatic, hard, and with beautiful markings; it takes a good polish. It is used for making agricultural implements, cattle bells, spokes and felloes of wheels, shoulder-poles, pestles, oil-mills. The wood is found to be particularly suitable for making various kinds of musical instruments, and for carving, inlaying and small fancy work. It also makes good fuel.

The fruit is edible. The bark has medicinal uses.

26. ALBIZZIA LEBBEC BENTH.

Family: *Leguminosae*

Local Names: Kalsish, siris.

English Names: Black Siris, Indian Walnut, Parrot Tree, Siris Tree, Woman's Tongue Tree.

Description: A large, deciduous, unarmed tree; branches spreading; bark brownish-grey, rough with numerous, small cracks. Leaves twice pinnate: axis 3-12 in. long, glabrous or downy, with 2 glands; pinnae 2-4 pairs; leaflets 3-9 or more pairs, 1-2 in. long, unequal sided, rigid, dark green, usually glabrous above, slightly pubescent and pale beneath. Flowers white, fragrant, 1.5 in. long, in large, globose, umbellate heads; stalks 2-4 in. long, in clusters of 2-4 from the upper axils; calyx small, tubular; corolla glabrous; stamens very long, greenish. Pods large, 4-12 in. long, thin, dehiscent, straw-coloured, glabrous; seeds 6-12.

Distribution: Central and Eastern Himalayas, Western Peninsula, Oudh and Kumaon.

Uses: This tree is considered by some as the true "siris," sacred to the Buddhists. The wood is dark brown, hard, fairly strong, handsome, lustrous, and durable. It is used for house-building, furniture, agricultural implements, rollers, oil and sugarcane mills, well curbs, canoes, boats, carts, toys, picture frames. It is also very useful for coopers' work, turnery, carving, internal decorations, panelling, and flooring. The "burrs" are highly prized, especially for making superior furniture and for veneers.

The bark is used for tanning and dyeing. If finely powdered it can be used as a detergent. The leaves and twigs are used as fodder, especially for camels.

The flowers, the bark and the oil from the seed are of use in indigenous medicine.

27. ALBIZZIA PROCERA BENTH.

Family: *Leguminosae*

Local Names: Karanji, karhar, safed siris.

English Name: White Siris.

Description: A large, unarmed, deciduous tree; bark yellowish-white, smooth, marked with horizontal lines; young shoots white, silky-pubescent. Leaves twice pinnate; axis 12-18 in. long, glabrous, with a large gland on the leaf-stalk; pinnae 2-6 pairs; leaflets 4-10 pairs, oblong-ovate, slightly leathery, glabrescent, dark-grey above, paler beneath. Flowers without stalks, whitish, in many flowered globose heads, 0.75 in. diam.; stalks 1 in. long, slender, in clusters of 3-5, arranged in large panicles, corolla pubescent; filaments greenish-yellow. Pods very shortly stalked, thin, strap-shaped, orange-brown, dehiscent, 4-8 in. long. Seeds 6-14.

Distribution: Central and Eastern Himalayas, the Western Ghats, Kumaon, Oudh.

Uses: The wood is brown and hard, resembling walnut wood. It takes a good polish; it is a valuable timber and is used for sugarcane mills, construction purposes, furniture, table-tops, large-sized panels, carts, carriages, dugouts, oars, agricultural implements, cart wheels, scantlings for bridges, rice pounders, well construction, and carving.

The leaves are used as fodder and valued as an insecticide.

The astringent bark is used for tanning, dyeing, and as fish poison. The gum that exudes from the bark is of value as a size in the manufacture of Nepal paper.

The leaves and the bark are of medicinal value.

28. ALEURITES MOLUCCANA WILLD.

Syn. A. triloba Forst.

Family: *Euphorbiaceae*

Local Names: Akhrot, akola, japhal akhrot, jungli akhrot.

English Names: Belgaum Walnut, Bengal Walnut, Candle Nut.

Description: A large, evergreen tree; bark rough, brownish-grey; shoots, young leaves, leaf-stalks and inflorescence densely clothed with brownish or grey tomentum. Leaves ovate or tri-angular, often 3-7-lobed, blade 4-12 in. long, provided with 2 glands at the insertion of leaf-stalk; leaf-stalk 2-5 in. long. Flowers unisexual, male and female flowers on the same tree, small, numerous, white, in large, terminal tomentose cymes. Fruit resembling a walnut, 1-2 in. diam., fleshy, a little compressed, green, 1- or 2-seeded.

Distribution: A native of South America; introduced into India and Pakistan; now practically throughout India and Pakistan and considered to be wild in various parts of India, especially South India.

Uses: The wood is soft and is used for making packing cases.

The plant is of commercial value because of the oil contents of its nut. A sweet, fine, clear oil is extracted from the edible nut; the oil is known as " kekuna "; it is chiefly used for purposes connected with the arts, being superior to linseed oil; it is used for making candles in conjunction with cotton and copra (cocoanut), for culinary purposes and for burning in lamps; the Javanese use it as a hair tonic; it very often serves as a substitute for tung oil, which is obtained from the nuts of other species of *Aleurites*; the soot deposited by the burning oil is used in Malaya as a substitute for antimony powder for colouring eye-lids. The oil-cake is a valuable cattle feed. The nuts are often stuck together by villagers to be used as candles. The juice from the walls of the fruit is acrid and can be used for tattooing.

A brown dye is obtained from the roots which the Sandwich Islanders use for dyeing their clothes. The bark is used as tanning material.

29. ALNUS NITIDA ENDL.

Family: *Betulaceae*

Local Names: Kunis, sharol, utis.

English Names: Himalayan Black Cedar.

Description: A large tree; bark blackish, with thin, quadrangular scales; branchlets and leaf-stalks pubescent. Leaves glabrous, thin, leathery, entire or crenate, elliptic-ovate, 2-6 in. long. Cones 0.75-1.5 in. long, 3-5 in erect lateral racemes; nut with a narrow, thickened edge.

Distribution: West Himalayas from Kashmir to Kumaon, up to 9,000 ft., along rivers and streams.

Uses: The wood is reddish-white to light brownish-grey, very light, lustrous and soft. It is largely used for house-building, where better timber is not available, bedsteads, country trucks and solid wheels. Hooked sticks required for the Himalayan rope-bridges are obtained from this tree. Match-sticks made from this wood are very good, but not boxes. The wood is considered suitable for peeling purposes.

The bark yields a dye and a tan.

30. ALSTONIA SCHOLARIS R. BR.

Family: *Apocynaceae*

Local Names: Chatwan, eda-kula, saitan-ka-jhad, shaitan.

English Names: Devil's Tree, Ditta Bark Tree, Shaitan Wood.

Description: A large evergreen tree; bark rough, dark-grey; branches arranged in a whorl; base often fluted or buttressed; all parts glabrous except the inflorescence. Leaves leathery, in whorls of 5-10, 4-8 in. long, obovate, shining above, pale beneath. Flowers greenish-white, without stalks, in umbellate, stalked, pubescent cymes; stalks in a whorl, 1-2 in. long. Follicles numerous, slender, distinct, pendulous, up to 24 in. long; seeds numerous, papillose.

Distribution: Sub-Himalayan tract from the Jumna eastwards, Eastern Bengal, Assam, the Deccan and the Western Ghats.

Uses: The wood is white to yellowish-white or pale brown, lustrous and light; it is not durable. It is used for making boxes, light furniture, carving, scabbards, coffins, tea-chests

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black-boards, etc.; it is very suitable for second grade pencils, and three-ply work.

The bark is a powerful astringent and tonic, and yields the "ditta" bark of commerce; it is of great use medicinally. The milky juice has medicinal properties.

31. ANACARDIUM OCCIDENTALE LINN.

Family: *Anacardiaceae*

Local Names: Hijli-badam, kaju.

English Names: Cashew Apple, Cashew Nut.

Description: A small or medium-sized evergreen tree; branches glabrous, smooth. Leaves entire, very leathery, obovate or oblong, 4-7 in. long. Flowers unisexual and bisexual on the same tree, in large, terminal, bracteate panicles; sepals downy; petals linear-lanceolate, yellow with pink stripes, 0.5 in. long; stamens 10, one longer than the others. Nut kidney-shaped, 1 in. long, seated on the flower-stalk enlarged into a thick, fleshy, pear-shaped, orange or red coloured "apple," 2-3 in. long. Seed kidney-shaped, oily.

Distribution: A native of South America, but now well established in the coastal regions of South India, Chittagong and the Andaman Islands.

Uses: The wood is reddish brown and moderately hard; it is useful for making tea-chests, indigo-boxes, packing cases, charcoal, and for boat building.

The bark yields a bright yellow gum which is an insect repellent; it is therefore used for binding books in place of acacia gum. The juice from the bark is employed for marking linen indelibly and for tanning fishing-nets. A yellow dye is also extracted from the bark.

A black, acrid, oily juice is obtained from the woody shell of the nut; two of its constituents are the phenolic compound "cardol" and anacardic acid; as a preservative against attacks of insects and white ants the juice is painted on timber, wooden rafters, floors, boats, books, etc. It serves as a good waterproofing agent and as a tan for fishing-nets. It is also used for tattooing, removing warts, and for marking linen indelibly. The corrosive oil resulting from the destructive distillation of the shell is used for making stove enamel paint.

Semi-solid to solid resins are prepared from the juice of the shell mixed with the juice from the shell of " bhilawan " (*Semecarpus anacardium*); these resins are employed for making enamels, varnishes, water-proofing compositions and moulding powders.

The seed is edible after it is roasted; it is very nutritious.

The " apple " or the enlarged stalk is very juicy, edible and rich in vitamin C; its juice makes a very pleasant beverage; by fermentation vinegar is made and also the well-known " kaju " wine. A preserve is made from the " apple."

Medicinallv the juice from the shell of the nut is used as a vesicant and rubefacient.

32. ANANAS COMOSUS MERR.

Syn. A. sativus Schult f.

Family: *Bromiliaceae*

Local Names : Ananas, anasa-pandu.

English Name : Pineapple.

Description : A herbaceous plant. Leaves in clustered, spirally arranged rosettes. Flowers bisexual from the centre of the rosette, terminal, without stalks, with a terminal crown of foliage leaves 'above.

Distribution : The plant is domesticated and now occurs all over the Peninsula and in other parts of India.

Uses : The leaves and the fruit are of great commercial value. The fruit is considered a great delicacy as a dessert. It is also used to a great extent for making alcoholic drinks and sweet beverages.

In many places the plant is cultivated for the fibre which is extracted from the leaves; the fibre is white, soft, fine, silky, strong and not affected by water; it is a valuable substitute for flax, and is used for a variety of purposes; it is spun into thread for weaving delicate fabrics; in the Philippines, this fibre is utilized for making the fine, expensive fabric, known as " pina "; it is also made into ropes, fishing-lines and strings. The thread spun out of this fibre is in great demand by shoe-makers ; it is particularly favoured for stringing beads and jewels. It has been suggested that the leaf refuse may be useful in the making of paper.

A poisonous substance is present in the unripe fruit which is used as a vermifuge and as a violent purge ; the juice acts as an abortifacient.

33. ANNONA SQUAMOSA LINN.

Family : *Annonaceae*

Local Names : Sharifa, sita pandu, sitaphal.

English Names : Custard Apple, Sugar Apple.

Description : A low, straggling, glabrous tree, with grey, thin bark. Leaves glabrous above, downy beneath, pubescent when young, oblong-lanceolate, **2-6** in. long, pellucid-dotted, scented when crushed. Flowers short-stalked, drooping, solitary or **2-4** together, greenish; sepals minute, triangular, pubescent; outer petals **3**, valvate, pubescent, lanceolate, thick, fleshy, **1** in. long; inner minute or absent. Fruit **2-4** in. diam., irregularly globose, tubercled, green; carpels lozenge shaped, outside tough, smooth and rounded; inside the seeds are covered with a white, sweet, custard-like pulp; seeds oblong, deep brownish-black, shining, acrid.

Distribution : A native of South America; naturalized in many parts of India and Pakistan; wild in Central and Western India.

Uses : The seeds and leaves contain an amorphous alkaloid. The seeds, leaves and immature dried fruits are used as an insecticide, for killing bed bugs and insects. The powdered, dried, unripe fruit is mixed with flour and used as a vermin killer; a pomade made with powdered seeds is used to kill body lice; a poultice of the powdered leaves is applied to maggot-infested ulcers to destroy the maggots.

The ripe fruit is valued as a dessert; a refreshing drink is made out of the sweet pulp.

The leaves, roots and other parts of the tree are greatly used in indigenous medicine.

34. ANOGEISSUS LATIFOLIA WALL.

Family: *Combrataceae*

Local Names: Bakli, dhau, dhaura, dhawa.

English Name: Axle-wood Tree.

Description: A large, deciduous tree; stem tall and straight, conspicuous by its smooth, grey, mottled bark. Leaves alternate, stalked, broad elliptic, pubescent when young, glabrous when full grown, 1.5-3.5 in. long. Flowers in small, dense, globose heads on short axillary stalks, usually in cymes; calyx 5-lobed; petals 0. Ripe fruit shining, glabrous, nearly round, broadly winged, entire, beaked; rusty-pubescent when young.

Distribution: A native of the forests of the Himalayas and Southern India; found in Madhya Bharat (Central India); up to 4,000 ft. elevation.

Uses: The wood is purplish-brown, lustrous, tough, strong and polishes well. It is used for poles, rafters, cart building, yokes, side pieces of solid wheels, agricultural implements, spinning wheels, rice pounders, mortars, helve timber, furniture, etc. It is particularly in demand for axles and shafts. It is also used for house-building by poor cultivators. It yields good charcoal; in some places it is used as fire-wood. The wood has also been found suitable for making skis.

The gum that exudes from the trunk is known as " gum ghati "; it is extensively used in calico-printing, for sizing paper and in Indian confectionery.

The leaves are very rich in tannin, containing about 19 per cent of tannic acid; they have a prominent place among tanning materials in light leather industry. They also yield a black dye. The bark also is used as a tan.

The Santhals use the gum as a cure for cholera.

35. ANTHOCEPHALUS INDICUS A. RICH.

Syn. Anthocephalus cadamba Miq.

Family: *Rubiaceae*

Local Names: Bol-kadam, kadam.

English Name: Kadam.

Description : A large, deciduous tree having horizontal branches and fairly smooth, dark-grey bark. Leaves elliptic-oblong or ovate, leathery, shining, glabrous above, pubescent beneath, 5-12 in. long. Flower-heads single, terminal, yellow, globose, 1.5-2 in. diam., fragrant; stalks 1-1.5 in. long; calyx lobes oblong, persistent; corolla glabrous. Fruit a fleshy, orange-coloured receptacle, 2-2.5 in. diam.; closely packed, few-seeded capsules inserted on the receptacle.

Distribution : Sub-Himalayan tract from Nepal eastwards, Eastern Bengal, Assam, Northern Circars, West Coast in Kanara, Malabar.

Uses : The wood is white, or light yellowish-grey and soft; in Chittagong it is much used for dugouts, canoes, carving and turnery. It makes excellent veneers. It is suitable for matchboxes and splints, cheap paper, furniture, beams, rafters, boxes, cheap boarding, tea-chests, light construction work, spools used in jute mills, etc.

The flowers are sacred to the Hindus and offered in shrines. A spirit is distilled from the flowers. The fruits are edible.

36. ANTIARIS TOXICARIA LESCH.

Family : *Moraceae*

Local Names : Alli, arañjili, chandul, jasund, karwat.

English Names : Sack Tree, Uppas Tree.

Description : A stately, gigantic, glabrous tree; trunk often buttressed; young shoots, leaf-stalks and midribs velvety. Leaves glabrous or hairy beneath, elliptic-oblong, entire or serrulate, rounded at the base, 4-8 in. long. Flowers unisexual, both sexes on the same tree; male flowers axillary, crowded on a thick, flat receptacle; female flowers solitary, enclosed in an involucre of bracts. Fruit red, velvety, fleshy, 0.75 in. diam., 1-seeded.

Distribution : Common in the evergreen forests of the Western Ghats up to 2,000 ft. altitude, the Deccan Peninsula, Coorg.

Uses : The juice from the stem is viscid, milky and resinous; it contains a virulent acrid poison, antiarin $\propto$ and β ; in Malaya, Java and other places this viscid juice is used for tipping arrows and darts to kill game.

The bark from the young trees can be readily stripped off in large pieces; it becomes white and furry if soaked in water and well beaten; it is then used by local people for making garments and sacks. The bark is also employed for making paper. A fibre is extracted from the inner bark; it is strong and tenacious, and suitable for making cordage and matting.

37. AQUILARIA AGALLOCHA ROXB.

Family: *Thymelaeaceae*

Local Names: Agaru, aggar.

English Names: Aloe-wood, Calamnac, Eagle-wood.

Description: A tall, evergreen tree; bark tough and pliable, grey on the outside with a corky layer, light buff-coloured on the inner surface; young shoots silky. Leaves slightly leathery. Flowers white, in sessile or shortly stalked, silky umbels. Perianth 0.25 in. long, silky without, densely hairy within. Fruit velvety, 1.5-2 in. long, obovoid, slightly leathery.

Distribution: A native of the mountains of Sylhet and Manipur, Khasi Hills, Garo Hills, Naga Hills in Assam, and Tipperara in Bengal; found only on the east side of India.

Uses: The wood is white to pale yellowish-white or light brownish-grey, and highly scented; it is the " Eagle-wood " or the true " agar " of commerce. Large trunks of the tree are used for making dugouts; the Karens make bows out of the light-coloured wood. Commercially the wood is in great demand when it is loaded with an oleo-resinous matter, the result of an infection by a fungus; the infected wood is distinguished by the presence of innumerable coarse, dark-coloured, irregular masses; the parts of the wood which contain these resinous infiltrations are darker and harder than those which do not have these resinous patches, and are also protected from decay; they last as long as more durable timber. The resin impregnated wood is much used for distilling the highly scented oil, known as agar attar, which is very much prized in the East as a perfume; this oil is also very valuable as a perfume retainer, and is greatly valued by European perfumers for mixing with their best grade perfumes; in Oriental countries this resinous wood is much used as an incense. In China " joss-sticks " are made out of this wood. In India and Pakistan it forms an important ingredient in the manufacture of " agar-batis " or " agar " lights, and of mixtures used for embalming the dead. The wood is insect repellent and so its powder is used as a preventive against fleas and lice on skin and clothes. In Malaya the aromatic wood is used as a cosmetic. It is also used by cabinet makers and inlayers, and for beads, rosaries, crucifixes, small jewel cases, ornaments, etc.

The bark yields a natural paper, and is used as such by the aboriginals of Assam; " mantras " and sacred books have been written on it. It is also used for covers of unbound books. A fibre is extracted from the bark; it is long, white, silky and very strong. Strips of the bark are used by the hill tribes for making ropes.

38. ARECA CATECHU LINN.

Family : *Palmae*

Local Name : Supari.

English Names : Areca-nut Palm, Betel-nut Palm.

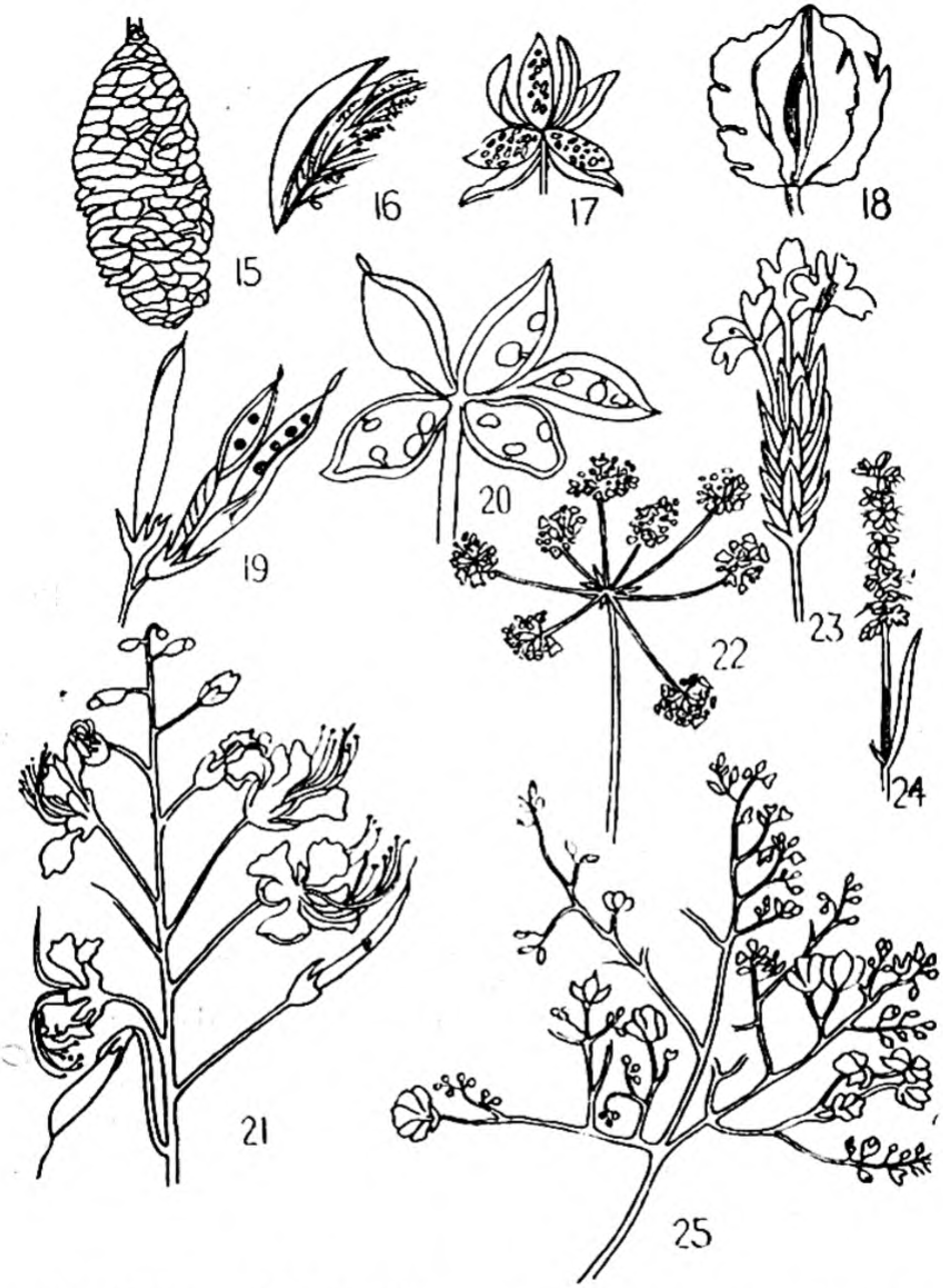
Description : A graceful, single stemmed palm, with a straight trunk and a tuft of feathery leaves at the top. Leaves pinnate, 4-6 ft. long; leaflets numerous, glabrous, 1-2 ft. long. Flowers unisexual, male flowers being on the upper part of the spike, female flowers at the base of the spike; inflorescence a much branched spadix; spathe glabrous, pale straw coloured; male flowers numerous, sessile; female flowers solitary, or 2 or 3 together. Fruit ovoid, 1.5-2 in. long, orange or scarlet, fleshy, fibrous, smooth, supported by the persistent perianth; seed solitary, in the upper half of the fruit.

Distribution : Throughout tropical India and Pakistan; cultivated along the sea coast.

Uses : The trunk is used in various ways, in house-construction, as pillars, joints, reapers, scaffolding, etc.; the hollowed out trunk is used as a water-channel. The wood is made into spear handles, bows, and furniture.

The leaves are used for thatching, and are woven into mats and rough bags. The leaf-sheaths are used as wrappers, as a substitute for paper to write on, and in the manufacture of paper and hats. The spathes also are used as a substitute for paper to write on; in Burma they are employed as a covering leaf for cheroots.

The galls resulting from the action of a certain insect on the palm are known as " mocharas," and are used as a tan.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15, Cone. **16**, Spadix. **17**, Capsule. **18**, Winged fruit. **19**, Legume. **20**, Follicles. **21**, Raceme. **22**, Umbel. **23**, Involucre of bracts. **24**, Spike. **25**, Panicle.

The most important part of the palm commercially is the fruit, the betel-nut or areca-nut. When boiled with lime the nuts yield the catechu known as "kossa." A decoction of the nut is used in dyeing. A tooth powder is made from the roasted nut; it is the well-known masticatory with "pan"; the "chikni sopari" of trade is prepared by boiling and drying the nuts. The young unhusked nut has astringent properties. The nuts are made into beads and other fancy articles.

The nut has medicinal uses.

39. ARGEMONE MEXICANA LINN.

Family: *Papaveraceae*

Local Names: Bherband, brahamha-dandi, pivla-dhotra.

English Names: Gamboge Thistle, Mexican Poppy, Prickly Poppy.

Description: A strong, prickly, branched, glabrous annual; juice yellow. Leaves without stalks, thistle-like, oblong, 3-7 in. long, pinnately divided, spinous, variegated with white. Flowers yellow, 1-3 in. across, terminal; sepals 3, prickly; petals 6. Capsules prickly, oblong-ovoid, about 1.5 in. long, opening by 4-6 valves; seeds numerous.

Distribution: A native of Jamaica; found throughout India and Pakistan on waste land up to 5,000 ft.

Uses: In Bengal and Bihar the plant is used as a pot herb. It is full of a yellow juice which is regarded as a valuable remedy for diseases of the alimentary canal. The seeds are narcotic. They yield a clear, yellow, semi-drying, bitter oil; it is largely used as a luminant, and in the manufacture of soap; to a certain extent it is used as a substitute for linseed oil; in America it is used by painters, and in South Africa as a preventive of white ants. It has also many medicinal uses, especially for syphilis and many skin diseases.

40. ARTEMISIA ABSINTHIUM LINN.

Family: *Compositae*

Local Names: Afsanthin, wilayati-afsantin.

English Names: The Absinthe, Maderwort, Wormwood.

Description : An aromatic, herbaceous, hairy perennial. Stem 1-3 ft. high, erect, angular, ribbed. Leaves 1-2 in. long, ovate or obovate, unevenly pinnately cut into blunt segments, pubescent on both surfaces. Flower heads numerous, yellow, globoid, about 0.25 in. diam., stalked, in drooping racemes at the ends of the branches. Outer flowers small and fertile. Fruit an achene, elliptic, oblong or obovate, minute.

Distribution : Kashmir from 5,000 to 7,000 ft.

Uses : The plant contains a volatile oil, which is a narcotic poison, a bitter glucoside, absinthin, and a bitter substance, anabsinthin. It is used to protect garments from insect attacks. The liqueur, Absinthe, contains an alcoholic solution of the volatile oil mixed with flavouring ingredients.

The herb has medicinal properties and is used as an aromatic tonic.

41. ARTOCARPUS CHAPLASHA ROXB.

Family : *Moraceae*

Local Name : Chaplash.

English Name : Chaplash.

Description : A large deciduous tree; young parts clothed with hairs. Leaves on old trees thinly leathery, broadly ovate or elliptic, entire, blade 6-10 in. long, stalk short; those on young trees and tender shoots, membranous and without stalks. Flowers unisexual, both sexes on the same plant, flower heads globose. Fruit globose, 3-4 in. diam., pubescent, tuberculate.

Distribution : Sub-Himalayan tract and outer hills from Nepal eastwards, Assam, Khasi Hills, Cachar, Chittagong.

Uses : The wood is yellow-brown to golden-brown at first, darkening to brown and is moderately hard. It is extensively used for ship-building, dugouts, house-building, oars, masts, carts, well-construction, etc. It is a valuable wood for furniture, boxes and general carpentry; it is very suitable for turning, carving, coopers' work, and shanks of built-up jute bobbins.

42. ARTOCARPUS HETEROPHYLLA LAMK.

Syn. A. integra Merr.
A. integrifolia Linn. f.

Family : *Moraceae*

Local Names : Kanthal, kathal, phanas.

English Name : Jack Fruit Tree.

Description : A large, evergreen tree; bark black, mottled green or dark brown, smooth. Leaves alternate, leathery, shining above, oblong or obovate-oblong, entire, 4-8 in. long. Flowers unisexual, both sexes on the same plant. Flower heads in buds covered with leathery deciduous stipules; male heads stout, cylindric, 2-6 in. long; female heads cylindric, hanging on short stalks from trunks and large branches. Fruit tubercled, oblong or cylindric, up to 30 in. long.

Distribution : Indigenous in the evergreen forests of the Western Ghats, up to 4,000 ft.

Uses : The wood is at first pale, but later turns a reddish-brown or mahogany colour; it is strong, durable and not attacked by white ants, and takes a beautiful polish. It is a favourite wood for musical instruments and furniture; it is also much used for house-building, country craft, masts, oars, carts, naves, felloes, yokes, rice pounders, cabinet work, tool handles, brush backs, well-construction and boxes; it is suitable for coopers' work, turnery and general carpentry.

The wood from the roots of the older trees is in great demand for carving work and for making picture frames.

By boiling the saw dust and wood ground to powder a light yellow dye, " basanti," is obtained; it is much used for colouring silk and robes of Buddhist priests.

An excellent bird-lime is made from the latex exuding from the fruit and the herbaceous parts of the tree; the quality of the bird-lime is much improved when this latex is mixed with that from the trees of *Ficus* spp. and the oil of " sagade," *Schleichera triguja*. The heated latex serves as a good cement for domestic use.

The fruit is edible. The seeds are eaten roasted or cooked. The male flower head is used as a vegetable. The leaves are used as fodder for cattle and goats.

The leaves and the latex have medicinal uses.

43. ARTOCARPUS HIRSUTA LAMK.

Family: *Moraceae*

Local Names: Aini, anjili, pat-phanas, ran-phanas.

English Name: Anjeli Wood Tree.

Description: A large, evergreen tree; bark grey, smooth; young parts covered with long, tawny hairs. Leaves broadly elliptic or ovate, leathery, usually entire or serrate, blade 5-12 in. long; hairy on the under side; stalk stout, about 0.75 in. long, yellow hairy. Flowers on axillary or terminal, stalked receptacles; male receptacle solitary or in pairs, cylindric, 3-4 in. long, erect at first, later pendulous; female receptacle solitary, ovoid, 1 in. long. Fruit ovoid, 3.5 in. long, clothed with numerous spines; seeds numerous.

Distribution: Found in evergreen forests up to 4,000 ft. elevation and in the plains of the west coast of Madras, Bombay, Travancore, Cochin, Coorg, and Mysore.

Uses: The timber is yellowish-brown, or blackish-brown, strong, light and moderately hard, but very durable both on land and under water; it is resistant to attacks of white ants; it is an all-round timber and is considered to be one of the best substitutes for teak in India, there is no purpose for which it cannot be used. It is one of the most valued timbers for boatbuilding in South India, dugouts, panelling, flooring, furniture, cabinet work, and veneers. It is also used in turnery, coopers' work, and carriage building.

44. ARUNDO DONAX LINN.

Family: *Gramineae*

Local Names: Bara nal, naldura.

English Names: Giant or Great Reed; Spanish Cane.

Description: A tall perennial grass; aerial stem arising from a creeping base, hollow, reed-like, many-noded, smooth, thin-walled, up to 18 ft. high, often with a white scurf. Leaves smooth, flat, 1-2 ft. long, drooping, tapering to a fine point;

leaf-sheaths tightly wrapped round the stem. Inflorescence a large, feathery panicle, light brown or yellowish-brown in colour, 9-24 in. long.

Distribution : Lower Himalayas from Kashmir to Nepal and Assam, the Nilgiris, Coorg.

Uses : The stem serves as a support for vines and similar climbing plants; it is also used for many domestic purposes; measuring rods, walking-sticks, fishing-rods, musical pipes, baskets, and mats are some of the articles made from the stem. The reed makes a better class of paper; in Italy the plant is utilized in the manufacture of rayon.

45. AVICENNIA OFFICINALIS LINN.

Family : *Verbenaceae*

Local Names : Baen, bina, kari, orei, tivar.

English Name : White Mangrove Tree.

Description : A small evergreen tree; bark thin, greyish-brown; branchlets quadrangular, with fine, white, silvery pubescence. Leaves ovate or elliptic-oblong, 2-4 in. long, leathery, glabrous and shining above, white or brownish pubescent beneath. Flowers yellow, sessile, in bracteate heads, arranged in terminal corymbs. Capsules ovoid, 1-1.5 in. long, compressed, beaked, grey-tomentose.

Distribution : Throughout the salt marshes and tidal forests of India and Pakistan.

Uses : The astringent bark is used as a tan. The ashes of the wood are used for washing and cleaning clothes; painters mix the ashes with their colours to make them adhere more firmly. The wood is chiefly used as fuel; it is also used for making cheap beams and door-frames.

The fruit is edible. The green fruit is used as a poultice for boils, etc.

46. AZADIRACHTA INDICA ADR. JUSS.

Syn. Melia indica Brandis; M. Azadirachta Linn.

Family : *Meliaceae*

Local Names : Bal-nim, limbo, nim.

English Names : Margosa Tree, Neem Tree.

Description : A large, glabrous, evergreen tree; bark greyish or brownish, rough. Leaves odd-pinnate, crowded on the ends of branches, 9-15 in. long, glabrous; leaflets 9-13, nearly opposite, falcate-lanceolate, unequal sided, serrate, blade 1-3 in. long. Flowers white, scented, in axillary panicles; calyx segments 5, glabrous; petals 5. Drupe ovoid-oblong, 0.5-0.75 in. long, smooth, yellow when ripe; stone 1-celled, 1-seeded.

Distribution : Throughout India; probably wild in dry forests of the Karnatak and parts of the Deccan.

Uses : The wood is red or brown, aromatic, durable and takes a good polish; it resembles mahogany and is not attacked by white ants; it is used for furniture, carts, axles, yokes, naves and felloes, ship- and boat-building, helms, oars, oil-mills, cigar boxes; carved images, toys, drums, tom-toms, agricultural implements, etc.

The bark yields a fibre which is locally utilized for making ropes; the bark also contains a gum, which is of great medicinal value.

The leaves are used as a pot herb and as an insect repellent; they are commonly kept amongst woollen clothes and books to protect them against insect attacks. The twigs are commonly used as chew-sticks or tooth brushes.

The most useful and valuable part of the tree is the seed, because of the fatty oil it contains; the oil which constitutes over 40 per cent of the seed is deep yellow, acrid and of a disagreeable odour; it is the well-known margosa oil of commerce. The active principles of this oil have recently been shown to be a series of crystalline and amorphous bitter constituents; the main active principle has been named " nimbidin "; the other constituents are " nimbin " and " nimbinin." Nimbidin has many therapeutic uses, and several pharmaceutical preparations containing this bitter principle have been evolved, such as face creams, hair lotions, medicated soaps, tooth pastes, etc. One of the by-products of nimbidin, viz., " nimbidol," has been found to be very useful as a denaturant for oils and fats. The refined oil is also used in the manufacture of soaps, cosmetics, disinfectants and emulsifying agents for insecticides.

The unrefined margosa oil is much used as a luminant and also in the manufacture of soap. The seeds are used as an insecticide, and by villagers for washing the hair. The seed-cake is a very good fertilizer; it can replace pyridine and other foreign products used in the manufacture of alcohol denaturants.

All the parts of the tree, including " nim toddy," the juice that exudes from the trunk spontaneously or through wounds, have considerable therapeutical uses in indigenous medicine.

47. BALANITES ROXBURGHII PLANCH.

Family : *Simarubaceae*

Local Names : Hingan, hingota, hingu, ingudi.

Description : A small thorny tree; bark yellow or cinerous; spines long, sharp, often leaf- and flower-bearing; young parts pubescent or hairy-tomentose. Leaves short-stalked, 2-foliate; leaflets elliptic or obovate, downy, entire, leathery. Flowers scented, small, whitish or greenish-white, crowded in clusters, axillary, 4-10-flowered cymes. Sepals and petals white pubescent. Fruit a drupe, ovoid, woody, large, 5-grooved; rind light grey, dry; pulp bitter with an offensive, greasy smell; stone hard, tubercled.

Distribution : Common in drier parts of India and Pakistan.

Uses : Walking-sticks and shoe-makers' boards are made out of the wood; but its chief use is as fuel. A fixed oil, known as " zachun," is extracted from the seeds. In Rajasthan the pulp of the fruit is used for washing silk as it contains saponin. The empty woody shell, after removing the seed through a small hole, is made into a bomb or cracker for local fire-works.

The bitter bark, leaves and seeds are used in indigenous medicine.

48. BAMBUSA ARUNDINACEAE RETZ.

Family: *Gramineae*

Local Names: Bans, kalak, kanta bans, nal bans.

English Names: Common Bamboo, Spiny or Thorny Bamboo.

Description: Stems thorny, numerous, tufted, up to 120 ft. high, curving at the top; branches numerous; internodes 12-18 in. long by 4-6 in. diam.; walls 1-2 in. thick, with a small cavity; nodes prominent, bearing in the lower parts of the stems dense half whorls of stiff, naked, horizontal branches, armed with 2-3 re-curved, stout spines; lowest nodes rooting. Stem-sheaths, leathery, orange-yellow when young, hairy outside, shining and ribbed inside, 12-15 in. long; blade triangular, glabrous outside, covered with a brown felt of bristly hairs inside. Leaves thin, linear, up to 8 in. long, glabrous above, hairy beneath; leaf-sheaths hairy, small. Inflorescence an enormous panicle, often occupying the whole stem; branchlets bearing loose clusters of pale, glabrous spikes.

Distribution: Wild in most parts of tropical India and Pakistan; up to 3,000 ft. altitude in the Nilgiris and hills of Southern India.

Uses: This is one of the most useful bamboos; it is extensively used for building purposes, scaffolding, ladders, tent-poles, shafts of carriages and tongas, and for many domestic purposes; split stems of this bamboo are woven into mats, baskets, fans, etc. The stems are also in great demand in the manufacture of paper pulp of good quality.

The seeds are edible and are especially used in times of scarcity. Leaves are used as fodder.

Benzoic acid and traces of a cyanogenetic glucoside are present in the shoots; they have a lethal action on mosquito larvæ.

The plant secretes within the joints a siliceous substance, known as "tabasheer"; it is of great medicinal value. Leaves and twigs are also used medicinally.

49. BAMBUSA TULDA ROXB.

Family: *Gramineae*

Local Names: Deo-bans, peka, talda bans.

Description: An unarmed, gregarious, densely tufted bamboo;

stem 20-70 ft. high, 2-4 in. diam.; walls thick; nodes not swollen; lower branches, stiff, horizontal, often leafy; internodes 1-2 ft. long; stem-sheaths 6-9 in. long, polished and sparingly hairy within, nearly glabrous outside. Leaves 6-10 in. long, underside usually softly hairy; leaf-sheath glabrous. Flowering branches usually leaflets; spikelets glossy, without stalks.

Distribution : The commonest bamboo in lower Bengal; also found in East Bengal, Assam, and hills of the Northern Circars.

Uses : It is one of the most useful bamboos. The stems are in great demand for building purposes, scaffolding, and for all general purposes; the split stem is woven into mats, baskets, fans, window-blinds, etc. It is also useful for making paper pulp. Young shoots are used as vegetables.

50. BARRINGTONIA ACUTANGULA GAERTN.

Family : *Lecythidaceae*

Local Names : Ijal, panniari, samudra-phul, sathphul.

English Name : Indian Oak.

Description : A middle-sized, glabrous, evergreen tree; bark dark brown, rough. Leaves obovate, rounded at the apex, minutely toothed, 2-6 in. long, dark green above, pale beneath. Flowers fragrant, red or pink, about 0.5 in. diam., in long, slender, drooping, many flowered racemes, 6-15 in. long. Stamens long, red or pink. Fruit quadrangular, oblong, about 1 in. long, narrowed at the base, crowned by the small persistent calyx.

Distribution : Throughout India and Pakistan from the Himalayas to Ceylon.

Uses : The wood is pinkish to reddish-grey, soft, durable; it is used for boat-building, well-construction, cabinet work, furniture, inner fittings of railway carriages, carts, rice pounders, etc.

Small pieces of the bark are used for intoxicating fish before catching it; the bark is used as a tan.

The fruit is bitter and astringent, and is used medicinally. The root is said to be useful in place of quinine.

51. BAUHINIA PURPUREA LINN.

Family: *Leguminosae*

Local Names: Khairwal, keolar, sona

English Names: Camel's Foot Tree, Geranium Tree.

Description: A moderate-sized, deciduous tree; bark thick, nearly smooth, ashy to dark brown in colour; young parts covered with brown pubescence. Leaves leathery, cleft about half way down into 2 lobes, cordate, ovate or roundish, 3-6 in. long. Flowers in terminal, short, pubescent panicles; flower-buds 5-angled; flowers large, deep pink, purple or rose-coloured; calyx cleft to the base into 2 segments; petals all similar, oblong-lanceolate. Pods 6-12 in. long, glabrous, flat, dehiscent.

Distribution: A native of the Sub-Himalayan tract from the Indus; common in Assam, Khasi Hills; also found in Bengal, Uttar Pradesh (the United Provinces), Madhya Bharat (Central India) and Southern India.

Uses: The freshly cut wood is pinkish white, ages to light greyish-red or dark brown, and is moderately hard; it is used for agricultural implements and inferior types of buildings. The gum that exudes from the trunk is known as "semki-gond." The bark can be used for dyeing and tanning; a fibre is extracted from it. The flowers and flower-buds are used as pot herbs, and the leaves as fodder.

The roots, flowers and bark are used in local medicine.

52. BAUHINIA VAHLII WIGHT & ARN.

Family: *Leguminosae*

Local Names: Chambuli, jallur, mahul, taur.

English Name: Camel's Foot Climber.

Description: A gigantic climber; stem thick, ridged and furrowed; branches densely pubescent; tendrils numerous, coiled spirally downwards, leaf-opposed. Leaves 2-lobed nearly to the middle, almost circular in shape, 6-18 in. diam., covered with densely ferruginous tomentum on the lower surface; leaf-stalk long, tomentose. Inflorescence a terminal raceme, clothed with a dense rusty tomentum; flowers numerous, cream-coloured, fading to yellow; petals 5, glabrous within, densely hairy outside.

Pods flat, woody, up to 12 in. long, velvety, longitudinally dehiscent; seeds 8-12, velvety.

Distribution : Sub-Himalayan tract and outer valleys ascending to 3,000 ft. from the Chenab eastwards, Assam, Bihar, and Western Peninsula.

Uses : Suspension bridges are made of the creeper in the Himalayas. The branches are used for making baskets and mats. A valuable tanning material is extracted from the stem. A soft cream-coloured leather is obtained if the hide is tanned with this material. The bark yields the fibre known as " selu "; it is used for making ropes for domestic purposes. The leaves are generally used for thatching roofs, for making umbrellas and baskets. In Sikkim they are also used for making crude leaf-bellows. The seeds are edible and have tonic and aphrodisiac properties.

53. BERBERIS ARISTATA DC.

Family : *Berberidaceae*

Local Names : Chitra, daru haridra, kashmal, raswat.

English Names : Indian or Nepal Barberry.

Description : A small spiny shrub, bright shining, reddish-brown, slightly drooping; young branches red. Leaves leathery, obovate or oblanceolate, 1.5-2 in. long, entire or with a few, spinescent teeth. Flowers golden-yellow, in large, drooping, long-stalked racemes. Berries spindle shaped, red.

Distribution : A native of the Himalayas and the Nilgiris.

Uses : A valuable product of the plant is the yellow dye extracted from the root, considered to be one of the best yellow dyes in India; it is soluble in water and alcohol; alkalis change the yellow colour to brown; the dye is employed in the manufacture of Morocco leather. Another product of the plant is " rasaunt," a brown extract obtained from the roots and the lower parts of the stem; in Sind it is added to drinking water, as it is supposed to make the water " cool." Its active principle is berberine. The dried berries are known as " zirishk turash " or acid currants. The seeds yield an oil.

The stem, the berries and the root bark have many medicinal uses.

54. BERRYA CORDIFOLIA BURRETT.

Family: *Tiliaceae*

Local Names: Chavandalai, thirukkanamallay.

English Names: Petwun or Trincomalee Wood.

Description: A tall, evergreen tree; bark pale, smooth. Leaves alternate, cordate, margins undulating, nearly glabrous, bright green, 4-8 in. long; leaf-stalk 2-4 in. long, slender. Flowers white, numerous, in lax, terminal panicles. Capsule supported by the persistent calyx, globular, pubescent, 6-winged, 3-celled. Seeds 1-4 in each cell.

Distribution: Common in Malabar and Travancore.

Uses: The wood is dark red or brown, very hard, strong and tough; it is well known for its durability and resistance to wear and tear both on the ground and in contact with water. It is in great demand for all purposes where strength, weight, toughness, and durability are essential. It is a favourite wood for building purposes, sampans, oars, masula surf-boats, carts, agricultural implements, spear handles, and bows; it is also used for turning, gun-stocks, walking-sticks, frames, shafts, bent parts of carriages and carts and bentwood furniture.

The fibre extracted from the bark is of poor quality.

55. BETULA UTILIS D. DON.

Family: *Betulaceae*

Local Names: Barjipatra, bhujpattra, bhurja.

English Names: Indian Paper Birch, White Himalayan Birch.

Description: A moderate-sized, deciduous tree, but a shrub at very high elevations; bark smooth, marked with white, horizontal spots; outer bark white, consisting of numerous, thin, papery pink layers, exfoliating in broad horizontal rolls; youngest shoot pubescent. Leaves ovate, unequally serrate, slightly hairy, blade 2-3 in. long. Female flowers in solitary spikes, bracts pubescent, 3-lobed. Nuts with a narrow wing, bracts in fruit leathery, deeply 3-lobed.

Distribution: Kurum Valley 10,000-16,000 ft., higher ranges of the Himalayas from Bhutan westwards at 10,000-14,000 ft., in the Punjab as low as 7,000 ft. Found at the highest limits of vegetation.

Uses : The wood is pinkish-white, moderately hard, tough and elastic; it is used for building purposes.

The most valuable part of the tree is its outer bark; it is used as a material for writing upon; charms and sacred songs in the northern parts are written on the bark. It is also chiefly used for umbrella covers, lining roofs from inside to make them water-tight, packing fruits and other articles, covering hooka-tubes, occasionally as textile, and in the manufacture of Russian leather. In Kangra it is used for funeral piles. In some parts thin strips of the bark are used in some forms of tie-dyeing. The bark possesses aromatic and antiseptic properties.

The plaited twigs are used in the construction of bridges.

56. BISCHOFIA JAVANICA BLUME.

Family : *Euphorbiaceae*

Local Names : Bhilar, kain, korsa, nilimara, paniala.

English Names : Bishop Wood, Java Cedar, Red Cedar, Vinegar Wood.

Description : A large, glabrous, deciduous tree; bark rough, dark brown. Leaves long-stalked, alternate, 3-5-foliate; leaflets elliptic-ovate or obovate, crenate, 3-8 in. long, leathery, glabrous, shining. Flowers greenish-yellow, in long-stalked, panicled racemes, unisexual, male and female flowers on different individuals; male flowers minute; sepals 5; petals 0; female flowers in clusters smaller than those of the male; sepals 5; petals 0. Fruit globose, fleshy; seeds 3-4, smooth, shining.

Distribution : Tropical Himalayas from Kumaon eastwards, Assam, Chittagong, the Western Peninsula from the Konkan to the Nilgiris.

Uses : The wood is fine, red, hard and durable; it is best used for pile foundations because of its great durability when in contact with water. It is in great demand for railway sleepers, bridges, buildings and other works of construction; it is also employed for boats, wells, wheels, furniture, cheap pencils; carving and firewood. The bark contains tannin.

The juice of the leaves has medicinal properties.

57. BIXA ORELLANA LINN.

Family: *Bixaceae*

Local Names: Latkan, rangamali, sendri, wilayati-haldi.

English Names: Annatto, Arnotto, Roucou.

Description: A handsome, small, evergreen tree with few branches, smooth, grey bark and dense foliage. Young shoots and inflorescence rusty-pubescent. Leaves alternate, cordate, glabrous, 4-8 in. long, entire or angular. Flowers in terminal panicles, large, white or purple; petals and sepals 5. Capsules ovoid, reddish-brown, 1.5 in. long, softly bristly. Seeds enclosed in a red pulp.

Distribution: A native of America; naturalized in India and Pakistan, and cultivated in many parts.

Uses: The tree is best known for the red pulp of its fruit, which yields a valuable dye. It is extensively used for colouring cotton and silk orange, and also butter, cheese, confectionery, hair oils, shoe polishes, floor polishes, and pharmaceutical ointments. It is occasionally used for colouring wool, sheep-skins, feathers, wax, ivory, bones, etc. The pulp is utilized for colouring the bodies of dancers in folk dances; it is applied to the skin as a mosquito repellent. The seed also yields a dye.

A fairly good fibre, suitable for cordage, is extracted from the bark.

The roots are used as a flavouring for meats to which are imparted the taste and colour of saffron.

The leaves, the pulp and other parts of the tree are of medicinal value.

58. BOEHMERIA NIVEA GAUDICH.

Family: *Urticaceae*

Local Names: Kankura, rhea.

English Names: China Grass, Ramie, Rhea Grass.

Description: A low, hairy shrub, with perennial root-stocks and herbaceous branches. Leaves cordate or broad ovate, 2-4 in. across, dentate, upper side rough, under side white, densely matted with hairs. Flowers small, green or greenish-yellow, in unisexual panicles, both sexes being on the same plant; male panicles in the lower axils; female panicles in the upper axils. Seeds minute, brownish-yellow, partly enclosed in the persistent calyx.

Distribution : A plant of the warm temperate regions; lower Himalayas, Assam, East Bengal.

Uses : The plant is well known for its fibre. The term "ramie" is used both for the plant and for its fibre; "ramie ribbon" denotes the fibre peeled off the bark; "china grass" is the name applied to the scraped and hand-cleaned ribbons. The fibre is exceptionally long, **3-16** in., very beautiful, lustrous and strong, stronger than cotton fibre. The fibre is much less affected than most other fibres by climatic conditions, chemicals, or sea-water; it has neither elasticity nor flexibility, and does not stretch or shrink when washed. The thread made out of the fibre is greatly valued for the manufacture of non-creasable and rot-proof textile fabrics, carpets, plush, gas mantles, drawn-thread work, embroidery, laces, and millinery. It can be used with advantage in place of cotton, wool, and flax. In Japan it is a favourite fibre for making fishing-nets. The fibre is particularly useful for making paper pulp required for the manufacture of bank notes.

59. BORASSUS FLABELLIFER LINN.

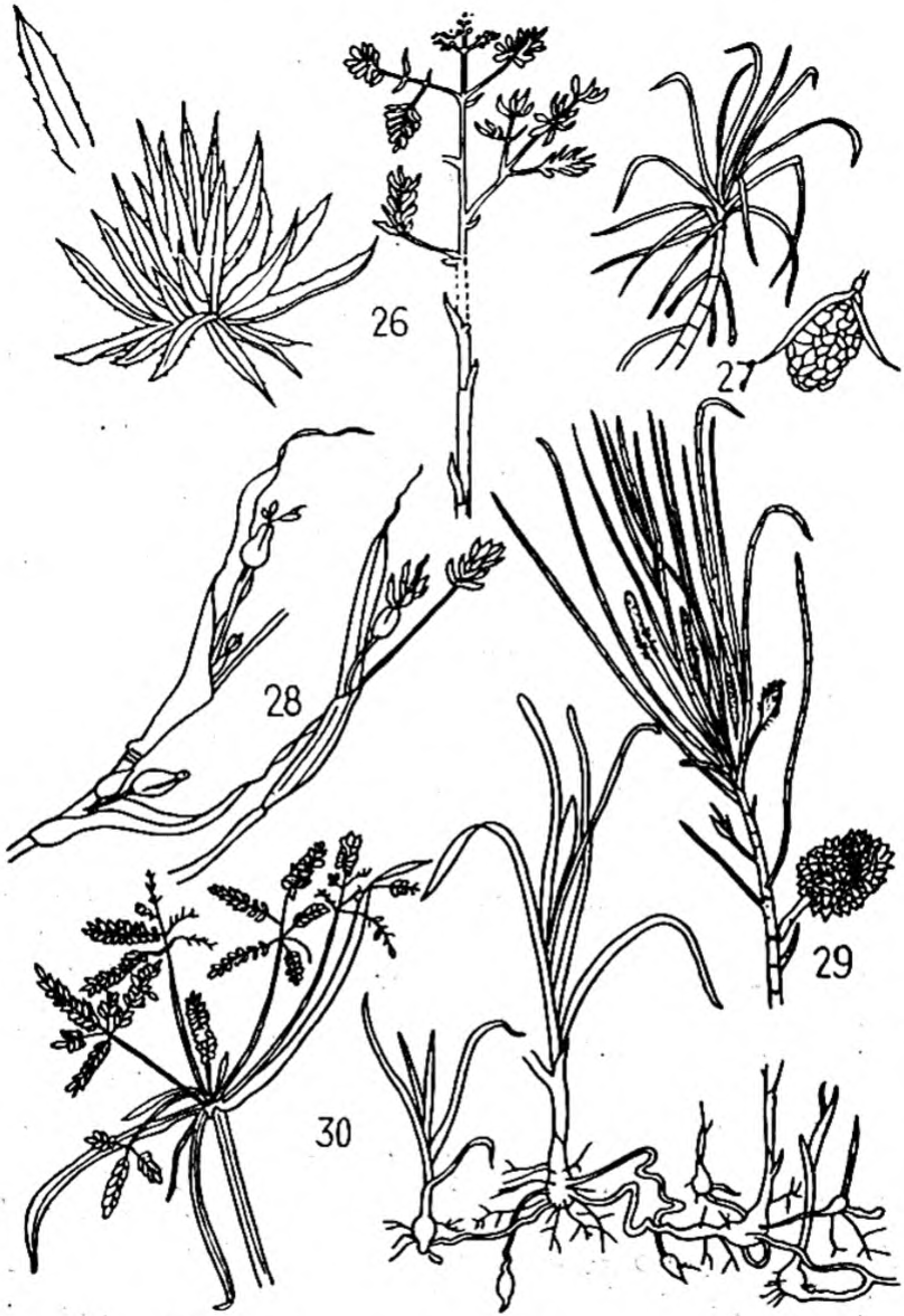
Syn. B. flabelliformis Roxb.

Family : *Palmae*

Local Names : Tad, tal, talgach, tar, tarka jhar.

English Names : Dessert Palm, Fan Palm, Palmyra Palm, Toddy Palm.

Description : A tall, black palm, swollen above the middle and again contracted upwards; young stem covered with dry leaves or bases of leaf-stalks; old stem marked with scars of the fallen leaf-stalks; base with a dense mass of long rootlets. Leaves almost circular or palmately fan-shaped, **3-5** ft. diam., rigidly leathery, segments **60-80**, shining, folded along the ribs; leaf-stalk **2-4** ft. long, stout, margins having hard, horny, sharp notches. Male and female flowers on separate trees. Male spadix branched, **9-15** in. long, covered with many bracts; flowers minute, in parallel rows. Female spadix unbranched; flowers **1** in. diam. Fruit a drupe, when young distinctly **3**-angled, but



26, Agave americana. **27**, Pandanus tectorius. **28**, Coix lachryma jobi. **28**, Casuarina equisetifolia. **30**, Cyperus rotundus.

globular when old, 6-8 in. diam., seated on the greatly enlarged perianth.

Distribution : A native of Bengal, Bihar, the Malabar coast extending from Cape Comorin through Travancore, Calicut, Goa, and Bombay State.

Uses : It is one of the most useful plants of India. Every part of the tree is of commercial value. The tree is too valuable to be cut for its timber, which is highly prized. The old trunk is used for a number of domestic purposes. The best and the hardest timber is obtained from the female palm. The timber is used for making pillars, posts, rafters, joints, reapers, bows, and in house-building. The hollowed out trunk is used for dug-outs and water channels. The wood from very old trees is dark; it is used for umbrella handles, walking-sticks, paper rulers, fancy boxes and other fancy articles; it is a useful wood for turnery.

The juice or the sap, especially from the male palm, is rich in saccharine matter; it is valuable for making sugar or jaggery, which is an important article of diet wherever this palm is commonly found; this jaggery has other important uses as well; it is used for making imitation white marble and a cement. The juice is known as toddy; it is either consumed as a beverage or converted into vinegar or distilled into a palm wine, "arak."

The leaves have a number of uses; they are made into fans, mats, ola-bags, water-baskets, umbrellas, broad-brimmed hats, and are also used for paper making and thatching. In Southern India the leaves are highly prized for manuring rice fields. The leaves are used for writing upon with an iron stylus.

A fine, downy substance is found at the base of the leaves; it is used for straining liquids through, and for stopping bleeding from wounds.

The palm yields a variety of fibres. Surrounding the leaf base is a strong, wiry, loose fibre. From the leaf-stalk is separated a fibre, the "bassine" of trade; ropes and twine are made from the finer fibre, and scrubbing brushes from the lower ends of the leaf-stalks. "Tar" fibre is extracted from the inside of the stem; it is used for making fish-traps. From the shell of the fruit and the leaves is prepared a fibre resembling coir or coconut fibre.

The fruits are edible; "palmyra pulp" is the sweet, mellow, farinaceous matter present in the ripe fruit. Young seedlings, "dantala," are used as a vegetable. Inside the apex of the tree is the cabbage containing a sago-like substance which is eaten as a delicacy.

The juice, the roots, and the fruit have medicinal uses.

60. BOSWELLIA SERRATA ROXB.

Family: *Burseraceae*

Local Names: Dhup, gugal, saleh, salai.

English Names: Incense Tree, Indian Frankincense Tree, Indian Olibanum Tree.

Description: A moderate-sized, deciduous tree; bark greenish-ash coloured, peeling off in smooth, thick flakes; young parts and leaves hairy. Leaves crowded near ends of branches, odd-pinnate, about 1 ft. long; leaflets 8-15 pairs, opposite, 1-2.5 in. long, lanceolate or ovate, deeply broadly crenate, unequal sided. Flowers bisexual. Fruit a 3-valved drupe, 0.25 in. long, 3-seeded.

Distribution: Very common in the moist forests of Central India, Bombay Deccan, Utkal (Orissa), Karnatak and the Circars; also found in Rajasthan, north Gujerat, Uttar Pradesh (the United Provinces), the Punjab and forests at the foot of the Himalayas.

Uses: The wood is yellowish-brown to dark greenish-brown, moderately hard, fairly durable; it is used for ammunition boxes, mica boxes, packing cases, cement barrels, inferior planking, cheap furniture, well-construction, water channels, sheaths for knives and swords, toys, masts of boats, coopers' work, fresh water piles completely immersed in water, hookas, match-splints and second grade plywood. Charcoal made from the wood is particularly favoured for iron smelting in Nimar. The wood is also used as fuel.

The tree is best known for the gum-oleo-resin, known as " salai-guggal," that exudes from the stem and branches; it is the olibanum or frankincense of the ancients; it consists of an essential oil, rosin, etc. The essential oil can serve as a substitute for the American pine turpentine, and the rosin for the low grade pine rosin. The oil is used in the preparation of quick drying varnishes and paints; the resin is also used for making varnishes, but is not suitable for rosin soaps or rosin sizes. The pungent, balsamic gum-resin is sold in bazaars as " luban " or " kundu," and is consumed in Central and Northern India; in Gujerat it is burnt as incense.

The bark contains 13-15 per cent tannin.

61. BRIDELIA RETUSA SPRENG.

Syn. B. montana Willd.

Family: *Euphorbiaceae*

Local Names: Asana, ekdania, kaj, kassi, pathor.

Description: A moderate-sized tree, having conical thorns on the stem and branches when young; bark thickish, grey or brown, rough with longitudinal cracks; branchlets and underside of leaves hairy. Leaves alternate, ovate or elliptic oblong, 3-7 in. long, margins entire or shallow-toothed, leathery, smooth, light-green, shining above, pale beneath, leaf-stalk very short. Flowers unisexual, male and female on different individuals, greenish-yellow, stalks absent or very short, in dense axillary clusters or in axillary or terminal spikes. Fruit globose, 0.25 in. diam. seated on the persistent calyx and petals, purplish-black, fleshy.

Distribution: Throughout the hotter parts of India and Pakistan. up to 3,500 ft., except in very dry regions.

Uses: The wood is drab to olive brown, moderately hard, durable, and stands up well under water; it is used for building purposes, carts, cart shafts, yokes, agricultural implements and drums. The bark is astringent, contains 16-40 per cent tannin, and is used for tanning. The fruit is edible.

62. BUCHANANIA LANZAN SPRENG.

Syn. B. latifolia Roxb.

Family: *Anacardiaceae*

Local Names: Char, charoli, chironji, mora.

English Name: Cuddapah Almond.

Distribution: A moderate-sized tree; bark very characteristic, 1 in. thick, dark grey, divided by deep narrow cracks into small quadrangular plates; young parts and inflorescence densely pubescent. Leaves thick, leathery, oblong, glabrous, shining above, softly hairy beneath, 5-10 in. long. Flowers small, without stalks, greenish-white, in large dense, many flowered, branched panicles. Drupe black, sub-globose, 0.5 in. long; stone hard, bony, 2-valved.

Distribution : Throughout India and parts of Pakistan; common in the drier and hotter parts.

Uses : The wood is greyish-brown, moderately hard and rather poor. It is utilized for small beams and rafters, mining timber, door and window frames, cheap furniture, bedsteads, boxes and yokes; it makes good match-boxes but not match-sticks. There are some who consider the timber as worthless, not even fit as firewood.

The bark is used for tanning; it has also adhesive properties. Both the bark and the fruit yield a natural varnish.

The fruit is sweetish in taste, and forms an important article of food amongst the indigenous tribes of Central India. The seed is an important article of commerce. It is used as a substitute for almond and has extensive uses in confectionery. From the seeds are extracted a pale, straw coloured, sweet and aromatic oil, known as " cheroonji oil," and a black varnish similar to that obtained from " bhilawa," *Semecarpus anacardium.*

From the stem exudes a pellucid gum having adhesive properties; it is useful for dressing textiles. In Uttar Pradesh (the United Provinces) this gum is employed in printing cloth, and in Berar in dyeing.

63. BUTEA MONOSPERMA (LAM.) KUNTZE

Syn. B. frondosa Koenig

Family : *Leguminosae*

Local Names : Dhak, kesuda, palas.

English Names : Bengal Kino Tree, Butea Gum, Flame of the Forest.

Description : A small, deciduous tree, with a gnarled, crooked trunk. Leaves 3-foliate; leaf-stalks 4-6 in. long; leaflets leathery, hard, entire, hairy beneath; terminal leaflet broad, obovate, 4-8 in. long; the lateral smaller, obliquely ovate. Flowers large, 2.5 in.

long, showy, the deep orange-red of the petals contrasting brilliantly against the jet black velvety calyx, densely clustered in racemes, 6 in. long; flower-stalk and calyx dark brown, velvety; petals prominently curved, covered outside with grey, silky pubescence. Pods stalked, 6-8 in. long, silvery hairy, pendulous, indehiscent, 1-seeded.

Distribution : Throughout the plains of India and parts of Pakistan.

Uses : The wood is white or brown, not durable unless kept under water. It is used for rough packing cases, well-curbs, piles, water scoops, and for making good gunpowder charcoal.

An astringent, ruddy coloured gum exudes from the bark; it is known as " Bengal kino," " Butea kino," or " Palas kino "; it is often used in place of the genuine kino of commerce (from *Pterocarpus marsupium*). It is used for tanning; it yields a strong and durable blue dye. The gum contains tannin and gallic acid.

From the bark and the roots a fibre is extracted; it is used for making cordage and paper, and for caulking boats; in villages the fibre is converted into slow matches.

The leaves are made into plates and umbrella coverings; they are also used for thatching, wrapping " bidis," and as a substitute for wrapping paper.

The flowers, fresh or dried, are known as " tessu "; they are in great demand for the dye they contain. They yield a brilliant yellow but fleeting dye which is much used for domestic purposes; cotton yarn can be dyed in three distinct shades, " kesari " or " kapil " (yellow) or " limbawati " (lemon yellow), depending on the quantity of the flowers used. They are also used for dyeing cotton fabrics and sola articles; in the past they were used for dyeing woollen carpets in Bengal. During the " holi " festival these flowers are in great demand for making " gulal " or " holi " powder.

The seeds contain a fixed oil and a water soluble albuminoid. The powdered seeds have insecticidal properties; maggots coming in contact with the powder are killed. The seeds are used as a substitute for santonine, and as a vermifuge for elephants and horses. The bark, seed and gum are much used in indigenous medicine.

The tree is one of the important hosts of lac insects.

64. BUXUS WALLICHIANA BAILL.

Syn. B. sempervirens Linn.

Family: *Buxaceae*

Local Names: Chikri, papar, papri, sansadu, shamshad.

English Names: Boxwood Tree, The Box.

Description: An evergreen much branched shrub or small tree; branchlets and young leaves pubescent. Leaves leathery, opposite, lanceolate to ovate, entire, 1-3 in. long. Flowers small, strongly scented, yellowish, unisexual, both sexes on the same plant, in dense, short axillary spikes; female flowers usually on the upper part of the spike; perianth lobes of the male flowers 4, of the female flowers 6. Fruit capsular, 3-valved, each valve having 2 horns.

Distribution: In the Suliman and Salt Ranges, the Himalayas from Nepal westwards at 4,000-9,000 ft. elevation.

Uses: The wood is yellowish-white, hard, durable, and smooth; it resembles ivory. It is very valuable for engraving on. It is in demand particularly for fine cabinet work, best quality combs, fine turning and carving. It is aslo used for croquet mallet heads and balls, flageolettes and other musical instruments, mathematical instruments, and fancy articles.

The bark is used as a febrifuge.

65. CAESALPINIA CORIARIA WILLD.

Family: *Leguminosae*

Local Name: Libi-dibi.

English Names: American Sumach, Divi-divi.

Description: A large bush; stem unarmed, foliage mimosa-like. Leaves even-pinnate, up to 9 in. long; pinnae 7-8 pairs, 2-3 in. long; leaflets numerous, small, very narrow, green above, pale below; main axis and pinnae axis hairy. Flowers fragrant, in short, dense panicles; petals yellow; filaments reddish. Pods thin, spirally twisted, not prickly.

Distribution: A native of South Africa and West Indies; introduced into India and Pakistan; naturalized in Madras, Bombay, Uttar Pradesh (the United Provinces) and South India.

Uses: The tree is well known as being one of the richest tannin bearing plants of India and Pakistan. The pod contains 40-45 per cent of tannin; it is much greater than in sumach (*Rhus cotinus* and *R. coriaria*) or myrobalans (*Terminalia* spp.). The pod is a true astringent; its tanning properties are not inferior to those of oak-galls and myrobalans. Leather cured with divi-divi is as good as that tanned with oak-bark.

The wood is reddish-brown and very hard, and yields a red dye.

The pods have medicinal uses.

66. CAESALPINIA DIGYNA ROTTLER

Family: *Leguminosae*

Local Names: Amal-kuchi, tari, teri, vakeri.

Description: A climbing shrub; bark dark brown or dark red with strong, recurved prickles. Leaves alternate, even-pinnate; pinnae 8-12 pairs; leaflets 7-10 pairs, small. Flowers yellow in terminal or axillary racemes; petals streaked with red. Pods fleshy, glabrous, thick, oblong, 1.5-2.5 in. long, twisted, beaked, 1-2 seeded.

Distribution: Chiefly found in Assam, Bengal, Chittagong, Madhya Pradesh (the Central Provinces), the Western Peninsula, and the Northern Circars.

Uses: This plant is valuable for the large amount of tannin the pods contain; it is as much as, if not greater than, in galls and other natural tanning materials. The pod-case contains more than 54 per cent of tannin, and the whole pod 28 per cent; the tanning value is higher than in divi-divi (*Caesalpinia coriaria*). The tannin from the pods consists of pure gallo-tannin; gallic acid for the manufacture of pyrogallol is obtained from this tannin.

67. CAESALPINIA SAPPAN LINN.

Family: *Leguminosae*

Local Names: Bakam, patang, tairi.

English Names: Erazil Wood, Sappan Wood.

Description: A middle-sized, thorny, shrubby tree. Leaves alternate, nearly glabrous, pinnate, up to 18 in. long; pinnae 4-6 in. long, 8-12 pairs; leaflets papery, oblong, oblique at the base, glabrous above, downy beneath, 10-20 pairs. Flowers yellow in panicles of long racemes, 12-16 in. long. Pods glabrous, thick, flattened, obliquely-oblong, prominently beaked, woody, polished brown, 3-4 in. long, 3-4 seeded.

Distribution : Generally cultivated, but runs wild in many places; found in South India, Chittagong, Utkal (Orissa), Madhya Bharat (Central India).

Uses : The commercially valuable parts of the tree are the wood and the pods. The tree is one of the sources of the red wood or Brazil wood of commerce; the wood is known as " bakam " or " sappan " wood. It is handsome, takes a fine polish, and can be used for inlaying and fancy work; but it is most valued for the dye it contains, commercially known as brazilin; the dye is so rich that a small quantity is enough for dyeing several yards of cotton fabric. It is fast on silk but not on cotton; it is extensively employed for wool dyeing and calico-printing. In Palghat it is in great demand for dyeing mats. Bakam gives bright red and violet shades; with a garcine it produces a chocolate tint; on the Coromandel Coast it is used in the making of the well known red dye, " Chay-dye." Bakam is not only used for dyeing fabrics but is also largely used in the making of the red powder known as "abir " or " gulal " so commonly scattered on the occasion of the " holi " or " doljatra " festival. A water extract of bakam is the red water used for the same occasion.

The bark and the pods also yield a similar dye. The bark is used for getting an orange-yellow dye; a fast red colour is also obtained from the bark.

The pod contains almost 40 per cent of tannin; in the production of light leather goods the pod can be used in place of sumach (*Rhus coriaria* and R. *cotinus*); the pod tanned leather has a uniform bloom and is soft to the touch; the pod can also be used in place of sumach in mixed chrome tannages.

68. CALAMUS ROTANG LINN.

Family: *Palmae*

Local Names: Bet, bent, natar, ratan.

English Names: Ratan Cane, Rotang Cane.

Description: Stem slender, climbing. Leaf-sheaths sparingly armed with short, flat spines, glabrous; leaves up to 2 ft. long, stalk very short, with small, straight or recurved spines; leaflets very numerous, narrowly lanceolate, bearing scattered bristles on both sides of the rib. Male spadix very long, branched, whip-like, sparingly spinous; female flowers scattered along the slender branches of the spadix. Fruit globose, small, scales many in a vertical series, straw-coloured.

Distribution: Common in moist localities in Bengal, Assam, and Southern India.

Uses: The stem and branches are the ratan cane of commerce. The cane is used in various ways. It serves as a prop for plants; it is made into furniture, baskets, wicker-work, umbrella ribs, ropes, cables, etc. Ropes made out of this cane are much used for dragging heavy weights and for tethering wild elephants. Cordage and cables for country crafts are made by twisting together two or more canes. The peculiar type of boats plying on the Megna are built out of the entire cane. The cane is also used for building suspension bridges over rivers and streams, as a substitute for whale bone, and for stiffening bonnets. The tender shoots and seeds are edible.

69. CALOPHYLLUM INOPHYLLUM LINN.

Family: *Guttiferae*

Local Names: Poon, poonang, sultana champa.

English Names: Alexandrian Laurel, Dilo Oil Tree.

Description: A handsome, moderate-sized, evergreen, glabrous tree, bark smooth, grey or blackish brown. Leaves opposite, leathery, broadly elliptic, shining on both surfaces. Flower buds with minute rusty hairs; flowers stalked, white, fragrant, in lax, few flowered, axillary racemes; unisexual and bisexual flowers on the same tree; sepals and petals 4 each; stamens many in 4 bundles; ovary usually purple. Drupe roundish, green, pulp scanty.

Distribution : A littoral species, indigenous in Malabar, Madras, Mysore, and the Deccan; throughout the east and west coasts of the Peninsula and Utkal (Orissa).

Uses : The wood is reddish-brown and moderately hard, fairly durable and elastic. It is in great demand for masts and spars, and on the south coast for ship-building, especially for keels and pulley-blocks; it is also used for house-building, railway sleepers, country craft, canoes, dugouts, etc. It is a first class wood for cabinet making.

An aromatic, yellowish-green, resinous gum exudes from the bark; it is known as " tacamahca gum "; in Tahiti it is used as a perfume; a volatile oil is distilled from this gum.

The valuable oil, " piney oil " or " dilo oil," is extracted from the seed; it is used for soap-making and burning in lamps. A mixture of this oil and " saldhupa " oil (from *Vateria indica*) is useful for caulking boats.

The leaves containing saponin and hydrocyanic acid are used as fish poison.

The leaves and piney oil have medicinal properties.

70. CALOPHYLLUM TOMENTOSUM WIGHT.

Family: *Guttiferae*

Local Names : Bobbi, nagari, poon kuve, sirpon.

English Names : Poon Spar Tree, Sirpoon Tree.

Description : A very large, magnificent, evergreen tree; bark furrowed with longitudinal fissures; branchlets quadrangular; young parts rusty tomentose. Leaves leathery, glabrous, shining, margins wavy, linear-elliptical, large. Flowers long-stalked, white, in axillary racemes or terminal panicles. Fruit sub-globose, about 1 in. long, brownish-yellow.

Distribution : In evergreen forests of the Western Ghats up to 5,000 ft.

Uses : The wood is lustrous, reddish-brown, elastic, moderately hard and fairly durable; it is attacked by white ants. The poon spars of commerce are obtained from this wood; it is in great demand for masts of ships, telegraph poles, bridge construction, building purposes, shingles, crane shafts, railway carriages, cheap furniture, dugouts and ferries. In South India the wood is commonly used for boat building.

The orange coloured oil extracted from the seed is used as a luminant.

71. CALOTROPIS GIGANTEA R. BR.

Family: *Asclepiadaceae*

Local Names: Ak, akra, arak, madar, rui.

English Names: Giant Milk-Weed, Swallow-Wart.

Description: A large shrub, covered with woolly tomentum. Leaves opposite, obovate or obovate-oblong, tomentose, without stalk. Flowers in lateral, umbellate cymes, purplish or white, corolla lobes hairy, spreading or reflexed, appendages of corona longer than broad. Follicles boat-shaped, green, up to 4 in. long; seeds numerous, ovate, flattened; hairs silky, long.

Distribution: Throughout India and Pakistan as a weedy shrub.

Uses: This is a very useful weed; its juice is milky; it contains a proteolytic enzyme similar to pepsin; an intoxicating liquor, "bar," is prepared from the juice by the local inhabitants of the Western Ghats; some tribes of Africa prepare a ferment from it called "giya"; it can be made into a kind of gutta-percha; a tan and a dye are obtained from it; it can also be used for dehairing hide.

The valuable fibre, bow-string hemp of India, is extracted from the plant; it is fine, strong and silky, having many of the properties of flax. It is one of the strongest vegetable fibres, and can well resist the action of fresh or salt water. It is readily woven into cloth and used for making sewing thread, bow-strings, carpets, ropes, bird and fishing-nets, fishing-lines, nooses and tiger-traps.

The silky floss from the seed is utilized for stuffing pillows, etc. Shawls and handkerchiefs have been made from this floss in the past, and also paper.

The plant yields a manna, known as "madar-ka-shakar."

From the roots is prepared gunpowder charcoal.

The various parts of the plant have various medicinal uses.

72. CALOTROPIS PROCERA R. BR.

Family: *Asclepiadaceae*

Local Names: Ak, madar, spalmai.
English Name: Swallow-Wart.

Description: An erect, white, downy shrub; juice milky. Leaves without stalks, cordate or ovate-oblong, 4-9 in. long. Flowers 0.75-1 in. diam., pink spotted with purple, in lateral umbellate cymes; corolla thick, cup-shaped; corona scales 5, fleshy, smooth, white. Follicles 4-5 in. long, thick, wrinkled, covered with white woolly pubescence.

Distribution: Throughout India and Pakistan.

Uses: The uses of this weed are the same as those of " rui," *Calotropis gigantea*. In some parts of Africa the milky juice is made use of in curdling milk for cheese, and in fermenting corn beer; it is also used as an infanticide and abortifacient. The leaves have insecticidal properties and are used for destroying fowl lice; the leaves clarify water, and so they are placed in a hole through which the water percolates.

The fibre extracted from the inner bark is known as " madar "; it is made into cordage.

The stem is resistant to white ants, and so it is used in Africa for foundations of mud-built grain storage receptacles. Pieces of the stem can also be used as floats for fishing-nets and traps. The root bark contains the bitter principle, mudarin.

This weed, like its near relative, *Calotropis gigantea*, has been found medicinally efficacious for a variety of human diseases.

73. CANANGA ODORATA HOOK. F. & TH.

Family: *Annonaceae*

Local Names: Cananga, ilang-ilang.
English Names: Alangilang, Motooi, Ylang-ylang.

Description: An evergreen, large, handsome tree; bark smooth, ashy. Leaves large, alternate, membranous, downy beneath, often oblique, margins wavy. Flowers on long stalks, drooping, yellow, fragrant, 3 in. long; petals 6, narrow-linear.

Fruit stalked, globose or ovoid, black, 10-12 segments, 6-12 seeded.

Distribution: A native of Burma, Java and the Philippines; not generally wild in India and Pakistan, but cultivated throughout the sub-continent.

Uses: The flowers are an asset of the plant; they contain essential oils; the well-known perfume, " ylang-ylang," is obtained from the first distillation of the flowers; the second distillation yields an inferior oil, known as " cananga oil " or " Macassar oil." Ylang-ylang is considered by perfumers to be the queen of perfumes, and forms an important ingredient of all high class perfumery; it is extensively used in the fixation of floral perfumes; it can be fixed with vegetable gums and resins; it is a very important item in the making of oriental attars. In the manufacture of face powders ylang-ylang is used with vetivert oil, bois de rose, etc. It is also much employed as a modifier in the manufacture of artificial perfumes.

Cananga oil is utilized for making cheap perfumes, hair oils, and for scenting soaps. The Macassar oil, commonly found in the bazaar, is a mixture of cananga oil and cocoanut oil.

74. CANARIUM STRICTUM ROXB.

Family: *Burseraceae*

Local Names: Dhup, gugal-dhup, kala dammar, manda dhup.

English Names: Black Dammar Tree, Indian White Mahogany.

Description: A tall, straight, balsamiferous tree, extremities at first densely rusty-tomentose. Leaves alternate, odd-pinnate, 1-1.5 in. long, more or less on flowering branches; leaflets 7-9, ovate-oblong, serrate, almost glabrous above, hairy beneath, 3-6 in. long. Flowers unisexual and bisexual in tomentose panicles or in clusters; calyx tomentose, corolla thinly tomentose above. Drupe 1.5-2 in. long, ovoid, with a thick, bony stone.

Distribution: Common in moist, evergreen forests of the Western Ghats up to 5,000 ft., Anamalis, Travancore, Kanara, the Konkan.

Uses: The valuable part of the tree is the resinous gum that exudes from the stem; it is translucent, reddish-brown and soluble in oil of turpentine; it is known as the black dammar of South

India. It has many uses; locally it is extensively used for caulking boats; its chief use is in the manufacture of varnishes, bottling wax, etc.; it is also used as a substitute for burgandy pitch in making medical plasters.

75. CANNABIS SATIVA LINN.

Family: *Cannabinaceae*

Local Names: Bhang, charas, ganja, hashish, kinnab, sidhee, subzee, vijaya.

English Names: Indian Hemp, Canvas.

Description: An annual, erect herb, up to 10 ft. high; stem slender, grooved, finely tomentose; branches few. Leaves alternate, stalked, palmately-divided; 2-8 in. long, toothed, long-pointed, dark green and rough above, pale downy beneath; leaflets 7-11, linear lanceolate. Flowers unisexual, male and female on different individuals, pale yellow-green; male flowers clustered in short, axillary, drooping panicles, perianth of 5 parts; female flowers axillary. sessile, erect, perianth a single, entire leaf enclosing the ovary. Fruit an achene, minute, enclosed in the persistent perianth.

Distribution: Throughout India and Pakistan on waste grounds and by the roadside, but wild only in the Himalayas up to 10,000 ft. Acclimatized or cultivated in the plains.

Uses: This annual herb is best known for the various narcotic preparations that can be made from it. Its most important constituents are a resin and a volatile oil; the resin is a potent intoxicant and a narcotic; it is utilized in three different forms in our country: (1) " ganja," (2) " charas," and (3) " bhang," " subzee " or " sidhee."

Ganja is the dried flowering tops of the female plant covered with a resinous exudation. It is chiefly used as a smoke like tobacco, alone or in conjunction with tobacco.

Charas is the resinous exudation covering all the aerial parts of the plant: the exudation contains a large quantity of a toxic red oil.

Bhang is the beverage prepared from an infusion of the dried leaves and flowering shoots with milk and other ingredients.

Of these three preparations bhang contains the least quantity of the narcotic drug. whereas charas is practically the drug itself and so more intoxicating and narcotic than the other two.

The Turkish intoxicating preparation, "hashish," is made from the leaves, and the Egyptian preparation from the husks of seeds.

The leaves and flowers are placed under bed-sheets to drive away bugs, especially in Chittagong and Kurseong. They are also used as a fish poison. They are irritating to the skin.

The seed oil is very useful; it is semi-drying and has an iodine value of above **150**. It is used as a luminant and in the making of paints, varnishes and soap. The seeds are fed to birds, poultry, etc. They are also given to milch animals to increase the flow of milk.

Another very important product of this annual is its fibre; the colour of the fibre depends on the method of its extraction; it can be nearly white, green, brown, or black; it is strong, durable, and not affected by water. Hemp fibre is highly valued for the making of ropes, cables, nets, sail-cloth canvas, tarpaulins, carpets, etc. It is in great demand as a material for packing in pumps, engines and pipe-fittings and for caulking boats. Hill tribes make a considerable use of hemp fibre for their domestic requirements, and for making strings, sandals and sheets.

76. CAPPARIS APHYLLA ROTH.

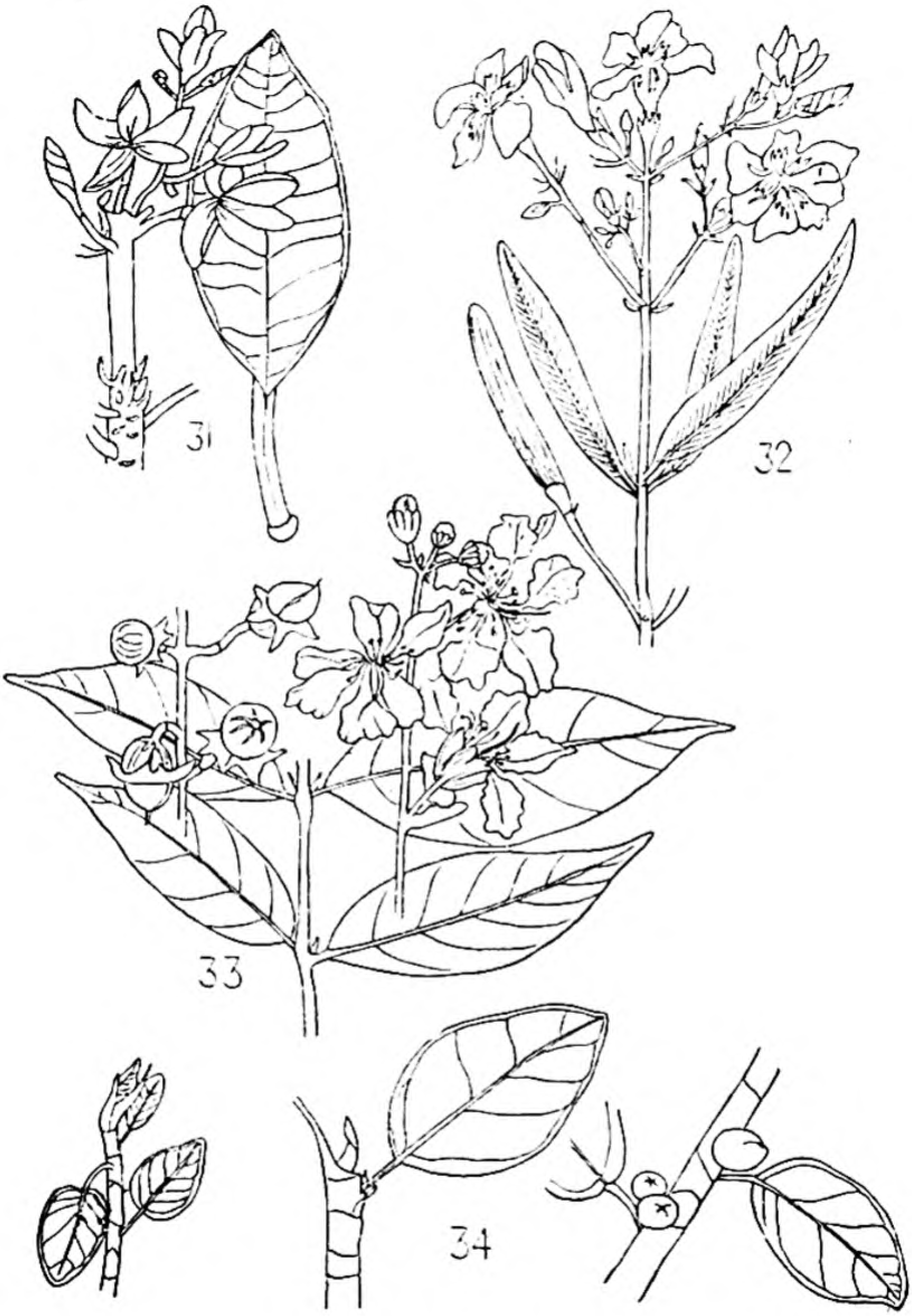
Family: *Capparidaceae*

Local Names: Karel, ker, kiral, lete.

Description: A large, twiggy shrub or small tree; bark grey, thick, corky, irregularly fissured; branches zig-zag, leafless when mature. Leaves small, linear, thick, sometimes red, having a pair of straight thorns at the base. Flowers reddish-brown, less than **1** in. diam. in many flowered corymbs; flower-stalks tomentose, slender; sepals **4** in **2** whorls, unequal; petals **4**, unequal, scarlet; filaments red, numerous. Fruit globose, red when ripe, fleshy, many-seeded.

Distribution: The Punjab, Sind, Gujerat, the Deccan, and generally in semi-desert parts.

Uses: The wood is light yellow, shining hard and bitter; it is resistant to attacks of white ants; it is very much used for beams, rafters, oil-mills and agricultural implements; in Sind it is



31, Plumeria acuminata. **32,** Nerium indicum.
33, Lagerstroemia speciosa. **34,** Ficus benghalensis.

favoured for making knees of boats. It is also good as firewood.

The tender shoots and leaves are of medicinal value.

77. CARALLIA BRACHIATA MERR.

Syn. C. integerima DC.

Family: *Rhizophoraceae*

Local Names: Andi, karalli, kirpa, kujitekra, palamkat, panasi, shengali.

English Name: Carallia Wood.

Description: A moderate-sized to large, evergreen tree, with characteristically opposite branches, often bearing aerial roots. Leaves very leathery, glabrous, shining above, glandular dotted beneath, elliptic or obovate-oblong, large, entire. Flowers yellowish-white, minute, without stalks, in small heads, arranged in short, stalked cymes; sepals and petals 7-8 each. Fruit globose, flattened, red, fleshy, small, 1-2-seeded.

Distribution: In damp, evergreen and swamp forests in the Sub-Himalayan tract, Nepal, Sikkim, up to 4,000 ft., Assam, Khasi Hills, Chittagong, Utkal (Orissa), Chhota Nagpur, the Circars, the Western Ghats.

Uses: The wood is reddish, pinkish or chestnut-brown, hard, beautiful and very attractive, and resembles the European oak in colour, and figure. It is used for house building, furniture, rice pounders, agricultural implements, cabinet making, handles of spears and " dahs," brush backs, ornamental panelling, parquet floors, picture frames, etc.

An infusion of the leaves is used in place of tea in Malacca.

78. CAREYA ARBOREA ROXB.

Family: *Lecythidaceae*

Local Names: Gadava, gavalda mara, kamba, kumbi, vakamba.

English Names: Slow Match Tree, Wild Guava.

Description: A large, stout, glabrous, deciduous tree; bark dark-grey, peeling off in narrow flakes, reddish and fibrous within.

Leaves usually without stalks, large, obovate, crenate, glabrous. Flowers large, pinkish-white, without stalks, clustered at the ends of branches, with an unpleasant smell; petals 4; stamens numerous, pink or purple. Fruit green, globose, 2-3 in. diam., glabrous, fleshy, crowned with persistent calyx and style; seeds numerous.

Distribution : Common in moist regions of the Sub-Himalayan tract from Jammu eastwards, Bengal, Madhya Pradesh (the Central Provinces), and the Peninsula.

Uses : The wood is light red to claret-red or reddish-brown, durable, flexible, polishes well, and stands well under water. It is used for making wooden vessels, agricultural implements, gun-stocks, furniture, house-posts, scantlings, carts, solid cart wheels, hoops, drums, planks, boats and oars in Assam, etc. It makes good fuel.

The bark yields broad bands of fibre suitable for making coarse cordage and sacks. The cordage is used for tying carts and rafters, for putting under elephant saddles, and for making fuses for slow matches. The bark is used as a tan and a dye.

The leaves are utilized for making " bidis " and for covering Burma cheroots; they are fed to Tassar silk worms.

79. CARICA PAPAYA LINN.

Family : *Caricaceae*

Local Names : Papaya, papita, pepe.

English Names : Melon Tree, Papaw.

Description : A small, soft wooded tree, usually unbranched, with milky juice and thin, greyish bark. Leaves in clusters at the top of the stem, large, glabrous, palmately divided; leaf-stalk very long, hollow. Flowers unisexual, the male and female flowers on different individnals, pale yellow, fragrant; male flowers in long drooping panicles; female flowers in short clusters; petals of the male flower united together to form a tubular corolla, those of the female not united together. Fruit large, variable in shape, succulent, indehiscent, 1-celled, seeds numerous.

Distribution : Indigenous in America; but cultivated all over India, Pakistan and the Tropics.

Uses: It is one of the most important fruit trees of India and Pakistan. Every part of the plant is full of a milky juice; it contains the proteolytic ferment, papyotin, which has properties similar to those of animal pepsin; it has a digestive action upon meat, toughest meat being easily made tender and soft; it also coagulates milk. The juice is used as a cosmetic to remove freckles and warts; it kills pain when applied to burns. The juice from the unripe fruit mixed with rectified spirit, dried and powdered makes the papain of commerce.

The leaves are used as a substitute for soap; in some places they are used as a vermifuge and smoked instead of tobacco. The seeds are used as a condiment.

The root serves as an abortifacient. The leaves, ripe fruits, seeds and roots have medicinal uses.

80. CARISSA CARANDAS LINN.

Family: *Apocynaceae*

Local Names: Garinga, karamcha, karanda, karwand.

English Name: Bengal Currents.

Description: A large, erect, evergreen, spinous shrub; branches glabrous, rigid; spines, long, horizontal, sharp, straight. Leaves broadly ovate, leathery, glabrous, dark green, shining above, paler beneath, 1-1.5 in. long. Flowers white, often tinted pink, fragrant, in terminal, stalked, 10-12-flowered cymes; lower part of the corolla tube cylindrical, upper swollen and pubescent. Fruit a berry, globose or ovoid, small, deep purple or black when ripe, filled with a sticky, milky juice. Seeds flat, usually 4.

Distribution: Throughout India and Pakistan, especially in dry forests.

Uses: The wood is orange-yellow, hard and smooth; it is suitable for turnery work, for making combs, spoons, and household utensils, and for fuel.

The fruit is edible, and is used for making preserves. It is considered to be useful as an auxiliary for tanning and dyeing.

The root is used as a fly repellent, when made into a paste; it and the fruit have medicinal uses.

81. CARTHAMUS OXYCANTHUS BIEB.

Family: *Compositae*

Local Names: Kantiari, kara, mian kalai, poli.
English Name: Wild Safflower.
Description: A thistle-like, downy herb, stem and branches white. Leaves oblong or oblong-lanceolate; lower with short, spinous teeth, upper very spinous, outer layer of bracts longer than the flower head; flower head white below the contracted portion, green above it with yellow spines; flowers orange-yellow; achenes obovoid, 4-angled, smooth, shining.

It is considered by some to be the wild form of the cultivated safflower, *Carthamus tinctorius*

Distribution: Very common in the drier and arid parts of North India and North Pakistan, especially in Peshawar District.

Uses: The shrub is of considerable commercial importance because of the oil contents of its seeds. Two kinds of oil are obtained from the seed, depending on the process used for the extraction; the oil obtained by cold expression is known as " poli " oil, and that obtained by the dry, hot process is known as " roghun " oil. Extensive use is mode of poli oil as a luminant, as food, in the preparation of Maccassar hair oil, and as a water-proofing agent in the manufacture of oil cloths, tarpaulins and tent cloth.

There is not much difference between roghun oil obtained from the wild plant and the oil extracted from the cultivated safflower, *Carthamus tinctorius*; but the Peshawari artizan uses only roghun oil in the manufacture of the famous Afridi wax-cloth. Roghun oil is also extensively used for greasing well ropes, leather well buckets and other leather articles used at wells; this oil keeps leather soft and pliable; it is also used as a very strong cement for glass and stone.

82. CARTHAMUS TINCTORIUS LINN.

Family: *Compositae*

Local Names: Barre, kara, kamalottara, kashumba, kusum.
English Names: Bastard Saffron, Carthamine Dye, Safflower.
Description: A glabrous, thistle-like, erect annual herb, 1.5 ft.

high. Leaves alternate, stiff, without stalks, lanceolate, 1.75-3 in. long, teeth spinous. Flower heads discoid, 0.5-1 in. diam., terminal; bracts surrounding the head numerous, spinous, erect; receptacle flat, densely bristly; flowers orange-red; corolla tube deeply 5-lobed, slender. Achenes glabrous, 4-angled.

Distribution: Said to be indigenous in the Indian islands; cultivated all over India and Pakistan.

Uses: The dried flowers of this annual are of commercial utility because of their two colouring principles, safflower yellow and safflower red. The yellow is obtained by repeated washing of the flowers in water; the red is soluble in alkaline water and precipitated by an acid. The tinctorial principle of this red colour is carthamine. Kusum flowers produce several bright and beautiful colour shades, such as yellow, scarlet, purple, cherry, rose, flesh colour, orange red, and shades of pink; but they are fugitive in character; the dye is used for colouring cotton and silk; for wedding clothes the red colour is especially used. Safflower yellow and safflower red are considered sacred by the Hindus. The dye is also used for colouring toys and articles made of pith. The dye is also much used in China. The precipitated red dye is used in the preparation of rouge.

The seeds are of value for the oil they yield; it is used as a food, luminant, and preservative of leather articles, like buckets, well ropes, etc. It is a drying oil, with an iodine value of about 150; it is very useful as a raw material in paint, varnish and allied industries. It imparts durability and weather resistance to paints made with it. It is especially useful for white paints and enamels used in interior decoration, as it does not yellow with age.

The seeds are used as food by the poorer classes; they are very good for feeding poultry.

The young plants are used as pot herbs. The dried plants are used for destroying bed bugs.

83. CARYOTA URENS LINN.

Family: *Palmae*

Local Names: Ardhi supari, baini, mari, mari-ka-jhad.

English Names: Bastard Sago, Fish-tail Palm, Indian Sago Palm, Kittul Palm.

Description: A handsome palm; trunk cylindric, annulate, grey, shining, smooth, covered with long shallow cracks. Leaves not grouped in a terminal crown, twice pinnate, up to 20 ft. long, 15 ft. broad; leaflets irregularly toothed or lobed like a fish tail, glabrous, bright green, shining, outermost leaflets pendulous. Leaf-stalk very stout at the base, lower part naked. Spadix up to 12 ft. long; stalk curved, stout, covered with leathery spathes; branches very long, simple, pendulous, resembling a huge, docked horse tail; flowers numerous, unisexual, both sexes on the same individual. Fruit up to 0.75 in. diam., roundish, reddish, outer covering thin, yellow, acrid.

Distribution : Sub-Himalayan tract from Nepal eastwards, up to 5,000 ft. elevation, Assam, Khasi Hills, Utkal (Orissa); very common in the Ghats and sub-montane forests of Mysore, in Malabar, Coorg, Konkan, the Circars, Cochin and Travancore.

Uses : This palm is commercially very useful. The fibrous cords found naked at the base of the leaf sheaths, within the leaf-stalks, flowering-stalks and the stem are of great commercial value. They are the " kittul " fibre of Ceylon, and the " salopa " of Utkal; they are finer, softer and more pliable than palmyra palm fibres. Ropes made of these fibres are so strong and durable that they are used for tying wild elephants. Kittul fibre is much used for fishing-nets, fishing-lines, ropes, bow-strings, baskets, brushes, brooms, and as a substitute for whale bones for stiffening corsets, etc.

The wood is hard and silicious outside, but soft within, strong and durable; it is made into agricultural implements, water-channels, buckets, rice-pounders, tank pipes, rafters and beams.

The leaves are a favourite fodder of elephants. The woolly substance present on the leaf-stalk is used as tinder and for caulking boats. The terminal bud or cabbage is edible. The juice of the palm can be made into toddy and sugar; sago of very fine quality and nutritive value is prepared from the farinaceous pith of the trunk of old trees. The seeds are made into beads.

The various parts of the palm are irritant to the skin.

84. CASEARIA TOMENTOSA ROXB.

Family : *Samydaceae*

Local Names : Baili, bheri, cilla, chilara.

Description : A small, deciduous, tomentose tree, with erect trunk, thick, ash-coloured bark, and spreading horizontal branches. Branchlets and underside of leaves tomentose. Leaves alternate, elliptic-oblong, 3-7 in. long, leathery, serrate, dotted with translucent glands. Flowers minute, greenish white, densely clustered on scaly, axillary tubercles; calyx pubescent, persistent; petals 0; stamens 8. Capsules succulent, ovoid, 0.75 in. long 6-ribbed, dehiscent.

Distribution : Sub-Himalayan tract from the Indus eastwards, Oudh, East Bengal, Central and Peninsular India.

Uses : The wood is fairly hard and tough; it is used for carving, and making into combs. The bitter bark is used for adulterating the red dye, kamela (*Mallotus philippinensis*). The pounded fruit is used as a fish poison. The leaves are used as medicated baths. The bark has medicinal properties.

85. CASSIA AURICULATA LINN.

Family : *Leguminosae*

Local Names : Avari, tangedu, taroda, tarwar, tarwat.

English Name : Tanner's Cassia.

Description : A large, pubescent, evergreen shrub, bark thin, cinnamon-brown, with numerous brownish spots. Leaves up to 4 in. long, closely arranged on branchlets; leaf-stalk slender, pubescent, with 8-12 glands; leaflets 8-10 pairs, elliptic-oblong. Flowers large, yellow, in terminal corymbose, bracteate panicles; calyx lobes 5, unequal, leathery; petals clawed, crisped on the margins. Pods flat, strap-shaped, thin, hairy, pale brown, up to 4.5 in. long.

Distribution : A common shrub in the forests of the Deccan, Gujerat, and Southern Mahratta country.

Uses : The shrub is best known for its astringent bark which is one of the most valuable tanning materials; it contains 19-22 per cent of tannin. It is most used for heavy hides where colour is not of much importance; it dyes leather to a buff colour; it is also used to modify dyes. The infusion of the leaves is slightly aromatic and is used as a substitute for tea in Ceylon, where it is known as "matar." The shrub is usually browsed by goats and cattle. The branches are used as chewing sticks or tooth brushes. The root is utilized in tempering iron and steel.

The bark, leaves and seeds have medicinal properties.

86. CASSIA FISTULA LINN.

Family: *Leguminosae*

Local Names: Alash, amaltas, bandarlauri, gurmala.

English Names: Golden Shower, Indian Laburnum, Pudding Pipe, Purging Cassia.

Distribution: A moderate-sized, deciduous tree; bark greenish-grey, compact, smooth when young, reddish-brown and rough when old; branches slender, pubescent at the extremities. Leaves glabrous, up to 18 in. long; leaflets 4-8 pairs, ovate or ovate-oblong, 2-5 in. long, slightly leathery, bright green above, pale beneath. Flowers large, scented, bright yellow, lax, drooping racemes, up to 2 ft. long. Pods cylindric, up to 2 ft. long, 1 in. diam., pendulous, smooth, shining dark brown; seeds numerous, in black, sweet pulp, separated by transverse partitions, smooth, shining, yellowish brown.

Distribution: Common throughout India and Pakistan.

Uses: The wood is yellowish-red to brick-red, durable, and takes a good polish. It is used everywhere for house building, carts, yokes, agricultural implements, rice pounders, bowls, tool handles, bridge posts, boat building, turnery, etc. It is highly prized as fuel and makes excellent charcoal. It is a high class furniture wood.

The bark is known as "sunari"; it is very useful for tanning; it contains 12 per cent of tannin, and can be used for the same purposes as avaram bark.

The tree is best known for the purging properties of the pulp of the pod, the "Cassiae pulpa" of the British Pharmacopœia. The bark, root, leaves and pod are much used in indigenous medicine.

87. CASUARINA EQUISETIFOLIA LINN.

Family: *Casuarinaceae*

Local Names: Chouk, jangli saru, saru, wilayati saru.

English Names: Australian Pine, Beef Wood Tree, Casuarina, She-Oak.

Description: A large, evergreen, fibrous tree; bark scaly, peeling off in vertical streaks; the ends of branches densely bearing numerous, long, filiform, slender, green, jointed, pendulous branchlets, 6-8 angled, with as many teeth or leaves as there are angles. Flowers unisexual, both sexes being on the same individual; male spikes terminal, linear, cylindric, at the extremities of branchlets, 1 in. long; female spikes at the base of the male spikes, small, ovoid, stalked, shortly jointed. Fruit ovoid or globose, small, having about 12 rows of velvety, dehiscent achenes.

Distribution : Indigenous in Bengal; very common in northern India, and coasts of Chittagong; well established from the Punjab to Ceylon.

Uses : The tree is planted on the coasts of India to reclaim sandy dunes.

The wood yellowish-pink to reddish-brown. The long, straight stem is highly prized as beams, posts, rafters, mine props, masts of country boats. The timber is useful for making oars, yokes, felloes of wheels, etc. The wood is in great demand as fuel. The bark contains 6-18 per cent of tannin, and is much used for tanning and dyeing fishing-nets brown, and also for tanning leather. A brown dye is extracted from the bark.

The astringent bark has medicinal uses.

88. CEDRUS DEODARA LOUDON.

Family : *Coniferae*

Local Names : Deodar, dewar, kilan-ka-per, kilar.

English Names : Deodar, Himalayan Cedar.

Description : A tall, evergreen tree; the leading shoots and extremities of branchlets drooping; foliage dark green or bluish green. Leaves 1.5 in. long, 3-sided, single on elongated shoots, but in dense culsters on arrested branchlets. Catkins cylindric, single, at the ends of arrested branches. Cones erect, 4-5 in. long and 3-4 in. diam. Scales thin, rounded. Seeds up to 0.75 in. long with triangular wings. Male and female flowers on the same tree or on different trees.

Distribution : Western Himalayas from 4,000-10,000 ft. Kurum Valley 7,500-10,000 ft., Chitral.

Uses : The wood is yellowish-brown, aromatic, oily, moderately hard and durable. The timber is of considerable utility and is classed as one of the three woods of great value in India and

Pakistan. It is not attacked by white ants. The stem is highly prized as masts for country boats. Logs from this tree make very good pile wood. The timber is valuable for building purposes, railway sleepers, railway carriages, telegraph poles, well construction; it is also much used for furniture, bottoms of carts and carriages, fermenting and storage vats for beer, gymnastic equipment, brush backs, saw frames, packing cases, boxes, general carpentry, ornamental carving, toys, keys of Indian sitar and of other similar musical instruments.

By destructive distillation of the wood " deodar tar oil " or " kelon-ka-tel " is obtained; this oil is used for preserving inflated skins employed for crossing rivers. It has antiseptic properties as well, and so it is used in veterinary practice.

The highly scented wood has medicinal uses.

89. CEIBA PENTANDRA (L.) GAERTN.

Syn. Eriodendron anfructuosum DC.

Family: *Bombacaceae*

Local Names: Hattian, katan, safed semal, sambal, senibal.

English Names: Kapok Tree, White Cotton Tree.

Description: A very large, deciduous, glabrous tree, covered with conical spines when young, supported at the base by wide spreading buttresses; branches horizontal in whorls. Leaves digitate; leaflets 5-8, elliptic. Flowers creamy-white, up to 1.5 in. long, in numerous axillary clusters, near the ends of branches; calyx green, bell-shaped, persistent, with 5 teeth; petals 5, fleshy. Capsules pendulous, spindle shaped, up to 8 in. long, 5-valved, filled with numerous balls of long silky wool, each enclosing a seed.

Distribution: Original home said to be tropical America, the Andamans and Malaya. Found in the Western Ghats where it may be indigenous, in the south and other hotter parts of India.

Uses: The wood is white, light and strong; it is very suitable for making dugouts. It is used for making furniture, wooden figures, toys, and drums. On account of its lightness, durability and very good accoustic properties the wood may be useful for making violins. It is used in tanning leather.

The most important product of the tree is the well known kapok of commerce; the silky floss is superior to any other vegetable fibre in elasticity, filling and buoyant capacity, and resistance to water-logging. Its buoyancy is superior even to that of cork and so it is highly valued for use in life-saving apparatus. It is so light and resilient that a smaller quantity is required than any other material, and so it is in great demand for stuffing in upholstery work, quilts and saddles. As the fibre contains a toxic substance it is resistant to vermin, mites, etc. In South Africa it is also used for caulking canoes. It is one of the best insulators for heat and sound; it is much used in the walls of aeroplanes. Mixed with other fibres, like cotton, it is employed in the manufacture of plushes, carpets, laces, felt hats, gun cotton, etc.

An inferior reddish fibre can be prepared from the bark which is used locally for making paper and ropes.

The seeds are edible and yield an oil which is used as a food and a lubricant, and in soap making. The oil cake is a good cattle feed. Young fruits are used as a vegetable and the leaves as fodder.

The tree yields a gum, "hattian-ke-gond," which is of medicinal value; leaves, bark, and fruits are also used medicinally.

90. CERIOPS TAGAL C. B. ROBINS.

Syn. C. candolleana Arn.

Family: *Rhizophoraceae*

Local Names: Chowree, goran, kirree, mada.

Description: A small shrub or tree. Leaves opposite, obovate, 2-3 in. long. Flowers in loose cymes, axillary, stalked; sepals 5, surrounded at the base with bracts; petals 5, glabrous, with 3-4 bristles; stamens 10. Fruit small, club-shaped or subovate, surrounded at the base by segments of the calyx.

Distribution: Common at the mouth of the Indus in Sind, in the Sunderbans in Bengal, and salt water creeks.

Uses: The wood is yellow to orange and hard. In Sind it is used for knees of boats, especially the bent branches; in lower Bengal the trunk is used for house posts, pit props and fuel.

All parts of the plant, especially the bark, roots, and fruits are highly astringent. They are extensively utilized in tanning.

Sole leather tanned with this material is very durable. In Malaya the bark is used for toughening fishing-nets. A dye is extracted from the bark; it is one of the chief dyes of Malaya; it gives a good black and purple colour with indigo; in Bengal fishing-nets are dyed with this bark.

A decoction of the bark is prescribed for stopping haemorrhage.

91. CHLOROXYLON SWIETENIA DC.

Syn. Swietenia Chloroxylon Roxb.

Family: *Meliaceae*

Local Names: Behra, billu, dhaura, halda, mashwal.

English Name : Satin Wood of South India.

Description : A small tree with a straight symmetrical trunk; young parts, leaf-stalk, and inflorescence clothed with grey pubescence. Leaves evenly pinnate, collected at the ends of branches, up to 8 in. long; leaflets 20-40, gland dotted, unequal sided, obliquely oblong, 1 in. long. Flowers small, bisexual, cream coloured, in small terminal and axillary panicles; calyx short; petals spreading, pubescent outside. Capsules 1 in. long, dark brown when ripe. Seeds oblong, winged.

Distribution : A very common tree in many forests of India, especially in Central and Southern India.

Uses : The wood is golden yellow at first, later darkens to a soft brown shade; it has a satiny lustre, is hard, and takes a fine polish. It is resistant to white ants, and stands immersion in water. It is useful for building purposes, bridge construction, wharf-piles, furniture, cabinet work, fancy work, veneers, interior decorative work. oil-mills, pestles, well construction, brush backs, railway sleepers, carving, turning, carts, boats, gun stocks, tool handles, and toys.

The tree yields a wood oil, a yellow dye and a pale coloured gum.

92. CHUCKRASIA TABULARIS ADR. JUSS.

Syn. Chikrassia tabularis Adr. Juss.

Family: *Meliaceae*

Local Names: Chickrassy, lal deodar, pabba.

English Names: Chikrassy, Chittagong Wood Tree.

Description: A large, deciduous tree. Leaves pinnate, alternate, up to 8 in. long; leaflets 10-16, usually alternate, unequal sided, velvety or nearly glabrous. Flowers white, 0.6 in. long, in panicles with spreading branches; calyx short, downy; petals oblong erect. Fruit an ovoid capsule, up to 2 in. long, 3-5-celled; seeds winged, numerous.

Distribution: Sikkim, Chittagong, Andamans, Western Peninsula along the Western Ghats and Mysore.

Uses: The wood is reddish- or yellowish-brown, hard, richly veined, handsome, scented when fresh and with a satiny sheen; it takes a fine polish. For ornamental veneers it is one of our finest timbers. It is much used for high class furniture, piano cases, wood-work of railway carriages, panelling, building purposes, carving, dugouts and canoes. The flowers contain a red and a yellow dye. A yellow transparent gum exudes from the trunk. The young leaves contain 22 per cent of tannin, and the bark 15 per cent. The astringent bark has medicinal uses.

93. CINNAMOMUM CECICODAPHNE MEISSN.

Family: *Lauraceae*

Local Names: Gondri, maligiri, rehu.

Description: A large, evergreen tree; bark 1-2 in. thick, dark grey, uneven, outside corky, highly scented. Leaves elliptic, blade 3-4 in. long, leaf-stalk 0.5-1 in. long. Flowers bisexual and unisexual, all on the same individual, in crowded, axillary, densely tomentose panicles. Fruit oblong, 1.25 in. long.

Distribution: Eastern Himalayas in Sikkim and Bhutan up to 4,000 ft., Assam, Sylhet, Khasi Hills, Manipur.

Uses: The wood is pale brown, soft to moderately hard, handsomely figured, strongly scented and takes a good polish; it is regarded as resistant to white ants; it is a valuable timber; being highly aromatic it is insect repellent and so very much prized for furniture, general carpentry and boxes; it is suitable for planking, oars, ploughs, yokes, dugouts, etc.

94. CINNAMOMUM TAMALA NEES.

Family: *Lauraceae*

Local Names: Dalchini, kikra, lavanga patte, taj, tajpat, tamala.

English Names: Cassia Cinnamon, Cassia Lignea.

Description: A moderate-sized, evergreen, aromatic tree; bark wrinkled, thin, brown. Leaves shortly stalked, in opposite pairs, glabrous, ovate-oblong or lanceolate, leathery, shining above, 3-6 in. long. Flowers often unisexual, numerous, white, in pubescent panicles; perianth small, silky, 6-parted. Fruit ellipsoid, succulent, 0.5 in. long, black when ripe.

Distribution: Indigenous in the Himalayas; common in East Bengal and Khasi Hills between 3,000 and 7,000 ft.

Uses: The bark is the Cassia Bark of commerce and is locally known as " taj." A fragrant oil is extracted from the bark which is largely used in the manufacture of soap. The bark is used as an auxiliary with " kamela " (*Mallotus philippinensis*).

The leaves, commonly known as " tajpat," are highly scented, and much used in the manufacture of vinegar and for flavouring food and cordials; with myrobalans they are employed in dyeing and calico-printing. In Kashmir they are used as a substitute for " pan," betel leaf.

The leaves and the bark are also much used for tanning skins and as an auxiliary with " kamela "(*Mallotus philippinensis*) as a dye.

Both the leaves (" tajpat ") and the bark (" taj ") have medicinal uses.

95. CINNAMOMUM ZEYLANICUM BLUME

Family: *Lauraceae*

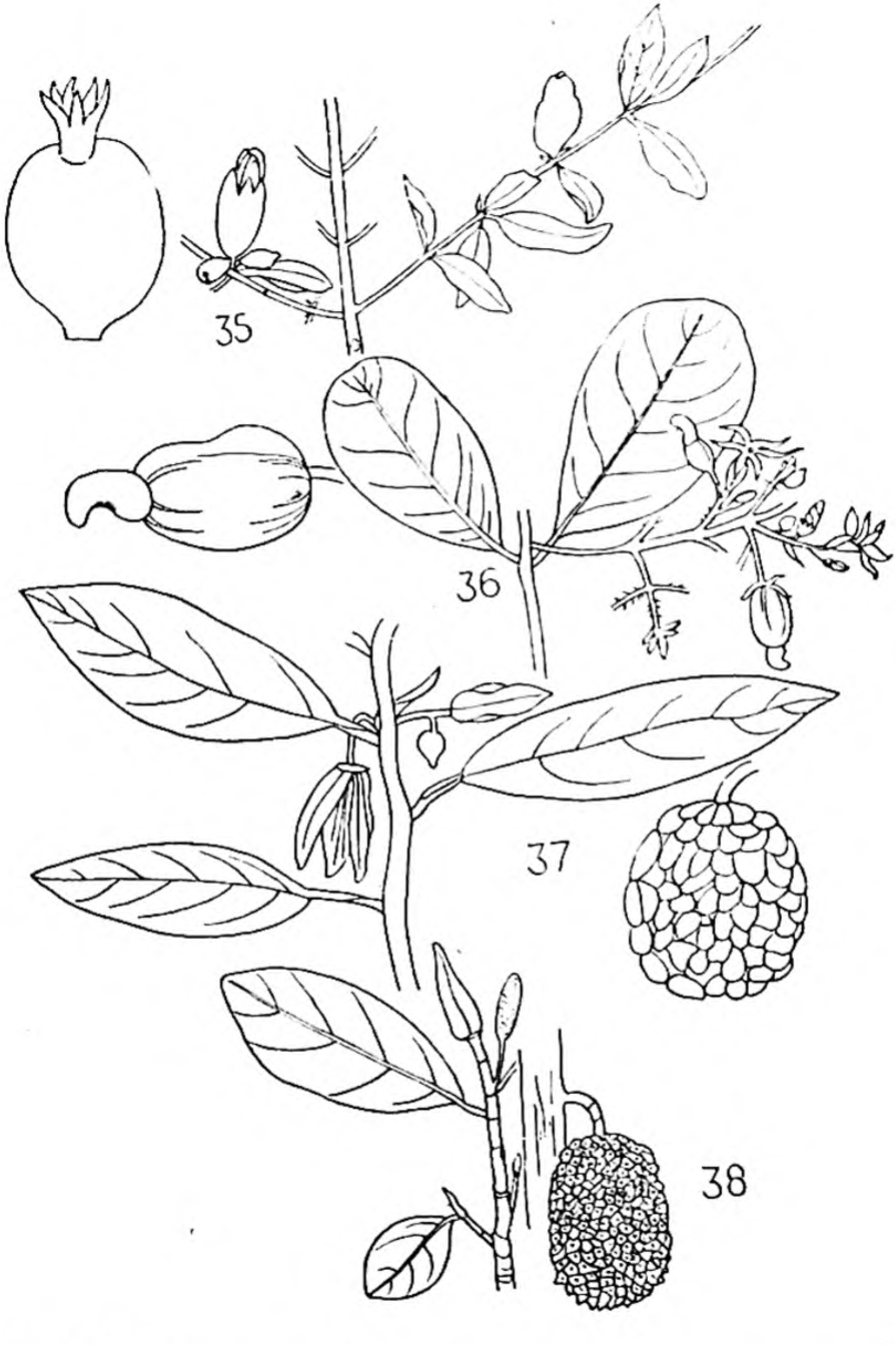
Local Names: Bojevar, dalchini, taj.

English Name: Wild Cinnamon Tree.

Description: A medium-sized tree; all parts very aromatic; branchlets compressed, grooved and glabrous. Leaves opposite or alternate, ovate-lanceolate, leathery, glabrous, pink when young, later dark green above, pale beneath, up to 8 in. long. Flowers in axillary, long stalked, lax panicles; buds silky pubescent; perianth very small. Fruit ovoid-oblong, 0.5 in. long, dark purple, smooth, seated on the much enlarged perianth.

Distribution: Indigenous in Western and Southern India in the rain forests along the Ghats up to 6,000 ft. elevation.

Uses: The wood is light brownish-grey to greyish- or yellowish-brown. Every part of the tree gives out a strong aroma when bruised. The true " dalchini " or cinnamon spice of commerce is obtained from the inner bark of the shoots and branchlets in the form of rolled quills. The root bark yields a camphor (kurz) of a very good quality. The tree yields three kinds of oils, differing in their chemical constituents. The essential oil of cinnamon is extracted from the bark; this oil is of golden yellow colour, sweet and aromatic, and contains a large percentage of cinnamic aldehyde; it is very much used in perfumes. The leaves give a brown, viscid essential oil; commercially very valuable; it is at times passed off as " clove oil "; it contains 70-90 per cent of eugenol, an important aromatic, largely used in perfumery and pharmacy, and for flavouring confectionery. The root gives a yellow oil, which has the smell of camphor, and is specifically lighter than water. An oil is also extracted from the berries. All these oils and the bark have medicinal uses.



35, Punica granatum. **36,** Anacardium occidentale.
37, Annona squamosa. **38,** Artocarpus heterophylla.

96. COCHLOSPERMUM GOSSYPIUM DC.

Family: *Cochlospermaceae*

Local Names: Buddam-ke-gond, galgal, gunglay, kumbi, kutheera-gond.

English Names: Buttercup Tree, Torchwood Tree, Yellow Silk Cotton.

Description: A medium-sized or small, deciduous tree; bark thick, fibrous, light coloured, deeply furrowed; young branches tomentose, marked with scars of fallen leaves. Leaves near the ends of branches, alternate, palmately 3-5 lobed, grey tomentose beneath, on thin, long stalks. Flowers large up to 5 in. diam., golden yellow, in few-flowered terminal panicles. Sepals 5, unequal, silky; petals 5, spreading. Capsules pendulous, pear-shaped, 2-3 in. diam., dark-brown coloured, 3-5-valved; seeds numerous, brown, covered with soft, silky wool.

Distribution: North-West Himalayas from the Sutlej eastwards, Bihar, Madhya Pradesh (the Central Provinces), Utkal (Orissa), Gujerat, the Deccan.

Uses: A clear, white gum exudes from the bark; it is known as "katira gum" or "hog gum," and is used as a substitute for "tragacanth" in Uttar Pradesh (the United Provinces); it is also much used in the manufacture of cosmetics, for thickening ice-creams, and by bookbinders and shoemakers.

The floss is used for stuffing in upholstery. The bark yields a cordage fibre. In some parts the soft wood is eaten. The branches, even when green, burn freely and so are employed as torches.

The gum has medicinal uses.

97. COCOS NUCIFERA LINN.

Family: *Palmae*

Local Names: Barl-kudum, narel, narikel, nariyel, tenna.

English Names: Cocoanut Palm, Porcupine Wood.

Description: A tall, stately palm, straight or curved, marked with ring-like leaf scars; base swollen and surrounded by a mass of rootlets. Leaves up to 15 ft. long; leaflets equidistant, up to 3 ft. long, linear lanceolate, leathery. Spadix up to 6 ft. long, stout, simply panicled, having both the male and female flowers; male flowers on the upper part of the inflorescence, numerous and unsymmetric; female flowers larger than the male, and at base of the inflorescence. Fruit 8-12 in. long, 3-angled, obovate or sub-globose, green or yellowish, cavity large, filled with a sweet, milky fluid.

Distribution : Original home not known; but common throughout the sea coast regions of India and Pakistan.

Uses : Wherever this palm grows it is of utmost value to man; every part of it is of considerable utility.

The wood is reddish-brown and soft inside; but the outside of the wood is red, hard and beautifully streaked, and takes a good polish. It is useful for rafters, ridge-poles, spear handles, shingles, building purposes, furniture, ladies' work boxes, walking sticks, turnery, ornaments and fancy articles, and for making charcoal.

The most important part of the tree is its fruit which has numerous uses. The fibre from the husk is known as coir, and is of considerable commercial importance. It is made into ropes; they are durable even under sea water, and so they are in great demand for use as cables for shipping purposes. The coir fibre is extensively utilized as a stuffing material for upholstery and saddles, and for the manufacture of matting and brushes. Recently the fibre is used for making hard boards and shockproof packing material.

The shell of the seed is woody, hard and light brown in colour; it takes a fine, dark brown to black shade when washed with an alkaline solution and rubbed with oil. It has many industrial, commercial, and domestic uses. The shell is of great value as domestic fuel, wherever coconut is widely grown; it is also much used for producer gas engines, for manufacturing activated carbon, and firing copra-drying kilns. The two halves of the shell are used as receptacles for collecting latex in rubber plantations, drinking cups, scoops, ladles, oil vessels and scrubbers. The shell serves as a resonant backing for musical instruments and is also used as a hooka. It can be carved, lacquered and inlaid with metal. Fancy ornamental articles, like bangles, cuff-links, buttons, tea-sets, spoons, beads, rings, etc., are made out of the shell.

The dried kernel is the copra of commerce; the oil extracted from it is of great commercial and industrial value; it is extensively used in the manufacture of soap, hair oil, and of food products. It is also much used as a luminant and as a substitute for cod-liver oil. The milky fluid found in the fresh nut is known as cocoanut milk and is highly valued as a cooling beverage; vinegar can be made out of the fermented cocoanut milk, In Malaya another product of the milk is " ayer banyar," prepared partly by fermentation of the milk; it is employed for darkening the colour of silk to be dyed purple and black. The watery contents of the immature nut are used for removing the surplus arsenia in colouring kris-blades.

The fallen, immature nuts have also been turned to commercial uses; they are converted into glazed boards, which are marketed under the trade name of " Coconite "; these boards are strong and can be varnished, painted and riveted. They are employed for internal panelling of railway coaches, roofing, and gin-washers. They are also used as insulators of sound and heat.

The juice tapped from the flower spathe is toddy or palm wine; coarse sugar or jaggery is made out of this juice. A heat-resistant cement, resembling white marble and capable of taking a fine polish, is made by mixing lime with this palm sugar. The juice, fermented or unfermented, is consumed as a beverage. The unfermented juice on distillation yields " arak "; vinegar is also prepared from the juice.

The leaves are extensively used as a thatching material; they are made into mats and torches. The ribs of the leaflets are converted into skewers, knitting needles, tooth-picks, utility and ornamental combs; a collection of these ribs are tied together and made into a broom. The ashes of the burnt leaves are rich in alkali. The woolly tomentum present at the base of the leaflets is used as a styptic.

The root is at times chewed in place of betel nut with pan (betel leaf).

The flowers, the green fruit and the dried kernel have medicinal uses.

98. COIX LACHRYMA JOBI LINN.

Family: *Gramineae*

Local Names: Gurgur, kassar, ran-jondhla, ran-makai.

English Name: Job's Tears.

Description: A tall, coarse, stout grass, 3-5 ft. high, rooting at the nodes; internodes polished. Leaves up to 18 in. long, 2 in. broad, smooth on both surfaces, margins serrate. Racemes about 2.5 in. long, nodding or drooping, long-stalked; female spikelet ovoid, entirely surrounded by a hardened bract which forms a bony sheath, yellowish-white or bluish-grey; male spikes arising from this sheath. Fruit broadly ovoid to globose, bluish-grey, smooth, polished.

Distribution: Common in wet places in most parts of India.

Uses: As a food this plant is unknown to the more civilized inhabitants of India, but to the hill tribes and to the aboriginal tribes of Madhya Pradesh (the Central Provinces), Sikkim and Assam it is almost a staple article of diet. From the grain gruel, tea and a decoction are prepared not only in India but also in Japan, China, and Burma. The Nagas prepare a malted beer, called "dzu," from the fermented grains. The shining, hard grain is extensively used as beads for rosaries by the Catholics, for personal adornment, and for decorating baskets, agricultural implements, cattle harness, etc., by the hill tribes.

The grain has medicinal uses.

99. CORDIA DICHOTOMA FORST. F.

Syn. Cordia Myxa Linn.

Family: *Boraginaceae*

Local Names: Baragund, bhokar, buhal, lasura.

English Names: Clammy Cherry, Indian Cherry, Sebestan.

Description: A middle-sized, low spreading tree with a crooked stem; branchlets glabrous. Leaves stalked, alternate, entire or slightly dentate, rough when full grown, variable in shape from elliptic-lanceolate to broad ovate, blade 3-6 in. long. Flowers small, unisexual and bisexual on the same plant, whitish, fragrant, in large open panicles. Berries yellowish-brown, pink or nearly black when ripe, shining, minutely rugose, ovoid, up to 0.75 in. long; stone wrinkled, 1-4-seeded.

Distribution : Throughout India, up to 5,000 ft. on the Himalayas.

Uses : The wood is greyish-brown, moderately hard or soft, light, fibrous and strong; it is useful for boat building, gun-stocks, agricultural implements, dugout canoes, tea chests, well curbs, cart building, house-posts, beams, scantlings, furniture, combs, bowls, utensils and fuel. In ancient Egypt the wood was employed for making sarcophagi.

From the bark is extracted a coarse fibre; it is used for making ropes, cordage, fuses, and paper pulp, and for caulking boats.

The leaves are valued for making the outer covering of Burma cheroots; they are also used for making plates. The green leaves are used in dyeing with " al " (*Morinda tinctoria*).

The fruit is edible; spirituous liquors are prepared from it. Its sticky, mucilaginous pulp is used as glue, birdlime, and also for marking linen; but the colour is not indelible. The juice of the fruit is used as a dye.

The tree is a host of lac insects.

The bark, leaves and fruit are of great medicinal value. The dried fruit is the " sebastan " of the Indian materia medica.

100. CORYPHA UMBRACULIFERA LINN.

Family : *Palmae*

Local Names : Bajar-batul, sritalam, tali, tara.

English Names : Fan Palm, Talipot Palm.

Description : Trunk erect, straight, cylindrical, up to 80 ft. high, annulate. Leaves 8-16 ft. diam., circular or crescent shaped, palmately divided, cleft to about the middle into innumerable lobes; leaf-stalk stout, up to 10 ft. long, margins armed with short, compressed, dark coloured spines. Spadix pyramidal, 10-20 ft. long, stoutly stalked; flowers small, greenish-white, clustered in slender, pendulous spikes. Drupes globose, shortly stalked, 1.5 in. diam., greyish, olive coloured, roughish. Seeds globose, very hard, smooth, polished.

Distribution : Found on Malabar Coast, Kanara; commonly cultivated in tropical India.

Uses : This palm has numerous economic uses. The leaves are made into fans, mats, umbrellas, and portable tents; they are also much used for thatching. The blades have been found very suitable for writing upon; some of the sacred records of the Singhalese are on pieces of these leaves.

A farinaceous substance is present in the pith of the trunk and is much used as food, especially in Ceylon; it is used as a substitute for corn.

The seeds are hard and are made into beads, imitation corals, buttons, etc. In some parts the seeds serve as fish poison.

101. CRATAEVA RELIGIOSA FORST.

Family : *Capparidaceae*

Local Names : Barna, barua, barun, karwan, kumla, varvunna.

English Name : Garlic Pear.

Description : A moderate-sized, deciduous, unarmed tree with white dots on branches; bark grey, horizontally wrinkled. Leaves tri-foliate, clustered at ends of branches; leaflets ovate, glabrous, shining above, pale beneath, 2-5 in. long. Flowers unisexual and bisexual on the same plant, 2 in. diam., cream coloured, in broad, terminal corymbs; sepals 4, petal-like; petals 4, much larger than sepals; stamens numerous, filaments purple. Berries ovoid or globose, woody, scurfy, up to 2 in. diam.; seeds numerous, kidney-shaped, embedded in a yellow pulp.

Distribution : Found in many parts of India and Pakistan, from the Ravi to Bengal, Assam, Central and Southern India, cultivated in many parts.

Uses : The wood is white or yellowish-white changing to light brown when old; it is tough, durable and moderately hard; it is used for making drums, toys, models, boxes, combs, writing boards, and planks. It is also useful in turnery and as firewood.

In the Punjab a strong cement is made by mixing the fruit with mortar; the rind serves as a mordant in dyeing. The fruit is edible.

The bark is bitter and is used as a tonic.

102. CROCUS SATIVUS LINN.

Family: *Iridaceae*

Local Names: Kesar, kumkuma, zafran.

English Names: Meadow Crocus, Saffron Crocus.

Description: Stem underground, fleshy and covered with sheaths; aerial stem absent. Leaves arising direct from the rootstock, narrow linear, channelled. Flowers solitary, violet, throat of perianth hairy; anthers yellow; style orange-red.

Distribution: A native of South Europe; but for centuries cultivated in Kashmir at Pampur.

Uses: The three long stigmas of each flower are the saffron of commerce; the red-orange tip of each of these stigmas is the " shahi zafran "; the remaining part of the stigma is saffron of inferior quality. In India and Pakistan saffron is one of the most favourite ingredients for colouring and flavouring confectionery and cooked rice and curries. Kazis use saffron for writing charms with. Romans and Greeks in olden days used saffron as an important dye. A small quantity colours a large volume of water; blue or green colours are produced in the presence of sulphuric or nitric acid or iron sulphate; with an iron mordant illuminated manuscripts can be made to resemble gold.

Saffron has many important uses, especially in medicine. A strong infusion will slowly and painlessly kill a small animal like a dog in a few days.

103. CROTALARIA BURHIA HAM.

Family: *Leguminosae*

Local Names: Bhata, booi, drunnu, ghagri, ghugharo, sis.

Description: An erect or prostrate annual shrub; branches numerous, pale grey tomentose, slender and flexible when young, stiff and rigid when old. Leaves simple, small, scattered, linear or oblong. Flowers yellow, fragrant, on long, terminal paniculate racemes. Calyx clothed with long, silky hairs; corolla yellow with red veins. Pods 3-4-seeded, nearly globular, hairy.

Distribution: Common in Sind, Baluchistan and in the arid parts of the Punjab, North-West Frontier Provinces, Rajasthan and Saurashtra.

Uses: The important produce of the plant is its fibre; it is used for cordage, coarse gunny cloth and canvas. Other species of *Crotalaria* also yield a fibre of similar utility; the fibre is known as "sann." The plant is also used as fodder.

The leaves and branches have local medicinal uses.

104. CURCUMA DOMESTICA VAL.

Syn. C. longa Linn.

Family: *Zingiberaceae*

Local Names: Halad, haldi, haridra, manjal.

English Name: Turmeric.

Description: Root-stock perennial, large, ovoid; tubers thick, cylindric, bright yellow inside. Leafy tufts 4-5 ft. long; blade 1-1.5 ft. long, oblong, leaf-stalk as long as the blade, green, deeply channelled. Spikes 4-6 in. long; flower-stalk 0.6 in. or more long, hidden by the sheathing leaf-stalks, flower bracts pale green, those of the coma tinged with pink; 1.5 in. long, ovate; flowers pale yellow.

Distribution: A native of South Asia; but widely cultivated all over India and Pakistan.

Uses: The useful part of the plant is the rhizome. which becomes the turmeric of commerce after it is boiled and dried. A yellow dye is extracted from it. The mother tuber contains more colouring matter and is sold under the name of "kachcha haldi." The dye varies from light yellow to orange. The colour obtained by direct dyeing with turmeric is not washed off by water; it turns red with alkalis; it is therefore used to detect the presence of alkalis. The colour is fugitive to light but can be made fast by using alum as a mordant. Turmeric dye is generally used as an auxiliary to other dyes, e.g., "al" (*Morinda tinctoria*), safflower (*Carthamus tinctorius*), indigo (*Indigofera tinctoria*), etc. Different fast shades of green and orange are produced in combination with other dyes. In the East turmeric is largely used for dyeing cotton cloth, especially at weddings and on festive occasions. In olden times it was much in demand for dyeing wool and silk; but at present its use is chiefly restricted to dyeing carpets. In India it is also used in calico-printing, in dyeing locally made paper, toys and articles made of pith.

In many countries turmeric is widely used for dyeing leather, thread, palm fibre, cotton, wool and silk. For domestic uses it is largely employed as a cosmetic round the eye, for dyeing confectionery, as a condiment, and for driving away ants by sprinkling its powder round ant holes.

The rhizome contains curcumine as the colouring matter; in addition to this dye it also contains an essential oil and an alkaloid.

Turmeric has also many medicinal uses.

105. CURCUMA ZEDOARIA ROSC.

Family: *Zingiberaceae*

Local Names: Amb-halad, ban-haldi, jungli halad, kachora.

English Names: Cochin Turmeric, Long Zedoary, Wild Turmeric.

Description: Root-stock large, ovoid; tubers many, cylindric, pale yellow or whitish inside. Leaves 1-2 ft. long, oblong, glabrous beneath, clouded with purple down the middle; leaf-stalk longer than the blade. Spike 6 in. long; flowering bracts 1.5 in. long, ovate, green, often slightly tinged with red; bracts of the coma many, bright red, spreading. Flowers pale yellow, shorter than the bracts; calyx whitish; corolla tube funnel shaped. Capsules ovoid, 3-angled, smooth.

Distribution: Largely found in the coastal tracts of Kanara and deciduous forests; a native of Bengal; wild in Eastern Himalayas.

Uses: The rhizome is aromatic and is one of the most important articles of Indian perfumery, especially in South India; it is also much used for perfuming medicinal oils, and by Indian women as a cosmetic. The flour from the rhizome is extensively used by the local people as a substitute for arrowroot and barley, and as a cooling demulcent and nutritious food; it is also made into confectionery. The finely powdered rhizome, coloured red with bakam wood (*Caesalpina sappan*), is "abir," extensively used during the holi festival.

The rhizome has many medicinal uses.

106. CYPERUS ROTUNDUS LINN.

Family: *Cyperaceae*

Local Names: Bhadra muste, mostaka, motha, nagur motha.

English Name: Nut Grass.

Description: A perennial, glabrous grass. Stem 6-30 in. long, 3-angled at the top, at base nodosely thickened, suddenly constricted into a rhizome, glabrous; underground stems slender up to 8 in. long, hardening into wiry roots, thickened into black, woody, ovoid tubers. Leaves as long as or longer than the stem. Umbels often branched, 1-4 in. diam., spikelets red-brown.

Distribution: Throughout India and Pakistan.

Uses: The useful part of the grass is the rhizome, which is spongy, aromatic, resinous and balsamic, and yields an essential oil. Cloth dyed in colouring solutions containing these rhizomes is impregnated with the perfume of the essential oil. This essential oil is used in perfumery and for soap-making, it is also utilized in the manufacture of "oud-batti," for scenting clothes and as an insect repellent. The roasted rhizome is in some places used as a substitute for coffee.

The leaves and stems serve as fodder for cattle and the rhizomes as food for pigs.

The rhizomes have many medicinal uses.

107. DALBERGIA LATIFOLIA ROXB.

Family: *Leguminosae*

Local Names: Kala shisham, shisham, sissu.

English Names: Black Wood, Indian Rose Wood, Rose Wood of Southern India.

Description: A large, deciduous, glabrous tree; bark ash grey, exfoliating in thin long flakes. Leaves alternate, up to 4.5 in. long; leaflets 5-7, alternate, orbicular or broadly ovate, firm, dark green above, downy beneath. Flowers small, whitish, fragrant, in lax, short, axillary panicles. Pods firm, strap-shaped, up to 3 in. long, 0-75 in. broad, 1-3-seeded.

Distribution: Chiefly found throughout the Indian Peninsula in deciduous forests; also occurs in Sikkim at the foot of the Himalayas, Lower Bengal, Bihar, and Oudh.

Uses: The wood is handsome, light to dark purple, durable and one of the Indian woods most resistant to attacks by white ants. It is very much prized for making superior types of furniture, internal decoration, interior panelling, cabinet work especially piano cases, and for such other purposes where a superior finish is required; it is also in great demand for making gun-carriage wheels, spokes and felloes of cart wheels, agricultural implements, and for carving. As it resists the action of water it is employed in well construction and for making knee-ribs of boats. It is one of the finest Indian woods for ornamental veneers, and is highly valued by the Chinese for making blackwood furniture. The wood is also used for coopers' work and for making measures for grain, oil, etc., bowls, jars, snuff boxes, handles of knives, "kukris" and tools, combs, brush backs, etc. Pieces of the wood are also employed as torches.

The heart wood yields an oil which is used for skin and foot diseases of cattle. Leaves and young twigs are fed to cattle.

108. DALBERGIA SISSOO ROXB.

Family: *Leguminosae*

Local Names: Safedar, shewa, shisham, sissai, sissu.

English Names: Sissoo, South Indian Redwood.

Description: A large, deciduous tree: bark grey, rough, peeling off in longitudinal strips; young parts pubescent. Leaves alternate; leaflets 3-5, alternate, firm, broadly ovate, 1-3 in. long, glabrous when full grown. Flowers yellowish-white, in short axillary panicles. Pods long stalked, strap-shaped, thin, pale brown, glabrous, 1.5-4 in. long, 2-4-seeded.

Distribution: Sub-Himalayan tract from the Indus to Assam up to 3,000 ft., Baluchistan, Suleiman Range, and the plains of India.

Uses: The wood is brown, hard, strong and durable. Wherever the tree grows the timber is in great demand for all purposes where strength and elasticity are required. It is used for all structural work, frames and knee-ribs of boats, bentwood furniture, bentwood handles, ordnance wheels, furniture, carts, carriages, yokes, ploughs, oil- and sugar-mills, well construction, oars, toys, hookas, coopers' work, turning, brush backs, combs, shoe lasts and "chappals"; it finds considerable use in the manufacture of sports equipment, such as croquet mallet heads and balls. Indian clubs, skis, frames of tennis rackets, etc. It is one of the principal woods for carving, inlaid work and lacquered ware. It is also largely employed for making keys of Indian sitar and similar other musical instruments, drums, tom-toms and Indian "country" pipes.

109. DAPHNE CANNABINA WALL.

Family: *Thymelaeaceae*

Local Names: Jeku, mahadep-ka-phul, satpura, set barawa.

English Name: Nepal Paper Plant.

Description: A large shrub or small tree, glabrous except for the young shoots. Leaves shortly stalked, crowded near the ends of branches, lanceolate, 3-5 in. long, slightly leathery. Flowers white or lilac, very sweet, in heads surrounded by numerous bracts; perianth tube cylindric, pubescent. Fruit ovoid, succulent, red or orange.

Distribution: The Himalayas from the Indus to Bhutan from 3,000-10,000 ft., Khasi Hills and Naga Hills.

Uses: The well-known Nepal paper is made out of the inner fibrous bark; the paper is pliable, elastic, strong and as durable as leather, and has a surface smooth enough to write on.

The flowers of the tree are used as offerings by the Hindus to their deities.

110. DENDROCALAMUS STRICTUS NEES.

Family: *Gramineae*

Local Names: Bans, bans khurd, kania bans, kopar, medar.

English Name: Male Bamboo.

Description· A deciduous, arborescent bamboo; root-stock much branched; stems perennial, greyish-green, often blotched, closely packed in dense clumps, up to 50 ft. high, lower part with short, stiff, spreading, usually leafless branches, upper part of the stem slender, leafy; internodes 10-15 in. long, 2-3 in. diam., almost solid in dry districts; joints swollen. Sheaths surrounding the stem shorter than the internodes, deciduous, stiff, shining, yellowish-brown, hairy or glabrous on the back; blade triangular, hairy on both sides. Leaves linear, up to 10 in. long, densely clothed on both sides with deciduous hairs. Inflorescence a large branching panicle, of dense, globose heads, 1-1.5 in. diam.; spikelets numerous, hairy, spinescent. Grain ovoid, shining, hairy.

Distribution : The commonest and most widely spread bamboo throughout India and Pakistan, up to the borders of the arid tract of North-West Pakistan, Salt Range, Sub-Himalayan tract from the Indus eastwards ascending to 3,500 ft.

Uses : Of all the bamboos of this sub-continent this is the most commonly used bamboo. The stem has innumerable uses; it is used for scaffoldings, rafters, battens, building purposes, furniture, mats, baskets, sticks, vessels for holding grease and oil, umbrellas, hand punkhas, sieves, bows and arrows, cordage, " lathis," masts, spars, tent-poles, water-pipes, cart-shafts, musical instruments, punting-poles, fishing-rods, ect.; the solid stems make the best lance shafts and masts for country boats. This bamboo is also extensively used for buoyage of heavy timber in rafting. Charcoal made from this bamboo is particularly used for finer smith work. The dry bamboo is used for torches and for producing fire by friction. It is also used for the manufacture of paper pulp.

The leaves are useful as fodder for cattle and horses.

A white, silicious substance is present near the joints; it is known as " tabashir," and is used medicinally. The leaves also have medicinal properties.

111. DERRIS ELLIPTICA BENTH.

Family : *Leguminosae*

Local Names : Bakal-bip, etam-chali, mokoi-sopu.

Description : A large, handsome climber; branches clothed with brown pubescence. Leaves odd-pinnate, long stalked, 12 in. or more long; leaflets 9-13, thin, firm, green and glossy above, downy and brown silky beneath, leathery, obovate-oblong, 4-6 in. long. Racemes up to 12 in. long, lax, elongated; main and secondary flower-stalks densely clothed with brown pubescence;

calyx very broad, densely silky, corolla bright red. Pods 2-3 in. long, 1-3-seeded, thin, flat, with one narrow distinct wing.

Distribution : Common in Chittagong.

Uses : The most important part of this climber is its roots because of their toxic contents. The roots are the tuba-root or derris of commerce. The most important toxic substance is rotenone; some of the others are deguelin, tephrosin, idotephrosin, toxicarol. These toxic substances are found more in the lateral fine roots than in the tap root. Because of their toxic contents the roots are very much used as an insecticide for the control of warble fly of cattle, certain poultry pests, and many agricultural and horticultural pests. Derris root is an important constituent of many a sheep dip; the powdered root mixed with talc powder is used as an insect powder for dogs and cats.

112. DILLENIA INDICA LINN.

Family : *Dilleniaceae*

Local Names : Chalta, ginar, motha karmal.

English Name : Elephant Apple.

Description : A medium-sized, evergreen tree, with a short, straight trunk, spreading branches, and a rounded crown of bright green foliage; bark smooth, red and moderately thick, peeling off in small, hard scales. Leaves at ends of branches, lanceolate, serrate, leathery, pubescent above and on the nerves beneath, blade 8-12 in. long; leaf-stalk channelled, 1-2 in. long. Flowers solitary, 6 in. diam., white, fragrant, at the ends of branches; flower-stalk club-shaped, 3 in. long, smooth, sepals 5, fleshy, persistent; petals 5, large, oblong, heavily crinkled; stamens numerous. Fruit 3-5 in. diam., hard outside, fleshy within, enclosed in the enlarged fleshy calyx; seeds numerous embedded in a glutinous pulp.

Distribution : Sub-Himalayan tract from Nepal eastwards, and in the moister regions of the Peninsula.

Uses : The wood is fairly hard, red with white specks, durable under water; it is used for making helves, gun-stocks, rafters well curbs, dugouts, boat building, panelling and inlay-work; it makes good firewood and charcoal.

The fleshy sepals surrounding the fruit are used as a vegetable; a preserve and a pleasant beverage are also made from them.

The fruit is edible; its glutinous pulp is used as a hair-wash. The hairy leaves are used for polishing horn and ivory.

The bark and the leaves are astringent, containing about 10 per cent of tannin, and are used medicinally; the fruit and the juice of the tree also have medicinal uses.

113. DILLENIA PENTAGYNA ROXB.

Family: *Dilleniaceae*

Local Names: Kamnagalu, karmal, tatri.

Description: A deciduous tree; bark grey or pale brown, outer layers exfoliating, forming shallow depressions. Leaves silky pubescent when young, 12-36 in. long. Flowers 1 in. diam., 5-10 fasciculate on tuberous growths on old branchlets; flower-stalks slender, 1 in. long. Fruit with enlarged fleshy sepals, up to 0.75 in. diam.

Distribution: Along the foot hills from Nepal eastwards, Assam, Bengal, Northern Circars, and west coast of Southern India.

Uses: The wood is very strong, hard, heavy and durable, when fresh cut its colour is light pinkish, but later turns light brown. The timber is used for house building, boat construction, carriage shafts, rice mills, and for making charcoal.

The fruit and flowers are edible. The leaves are employed to line the inside of thatched roofs; they are fed to cattle; old leaves are used for polishing ivory and horn. The bark yields a fibre used for cordage.

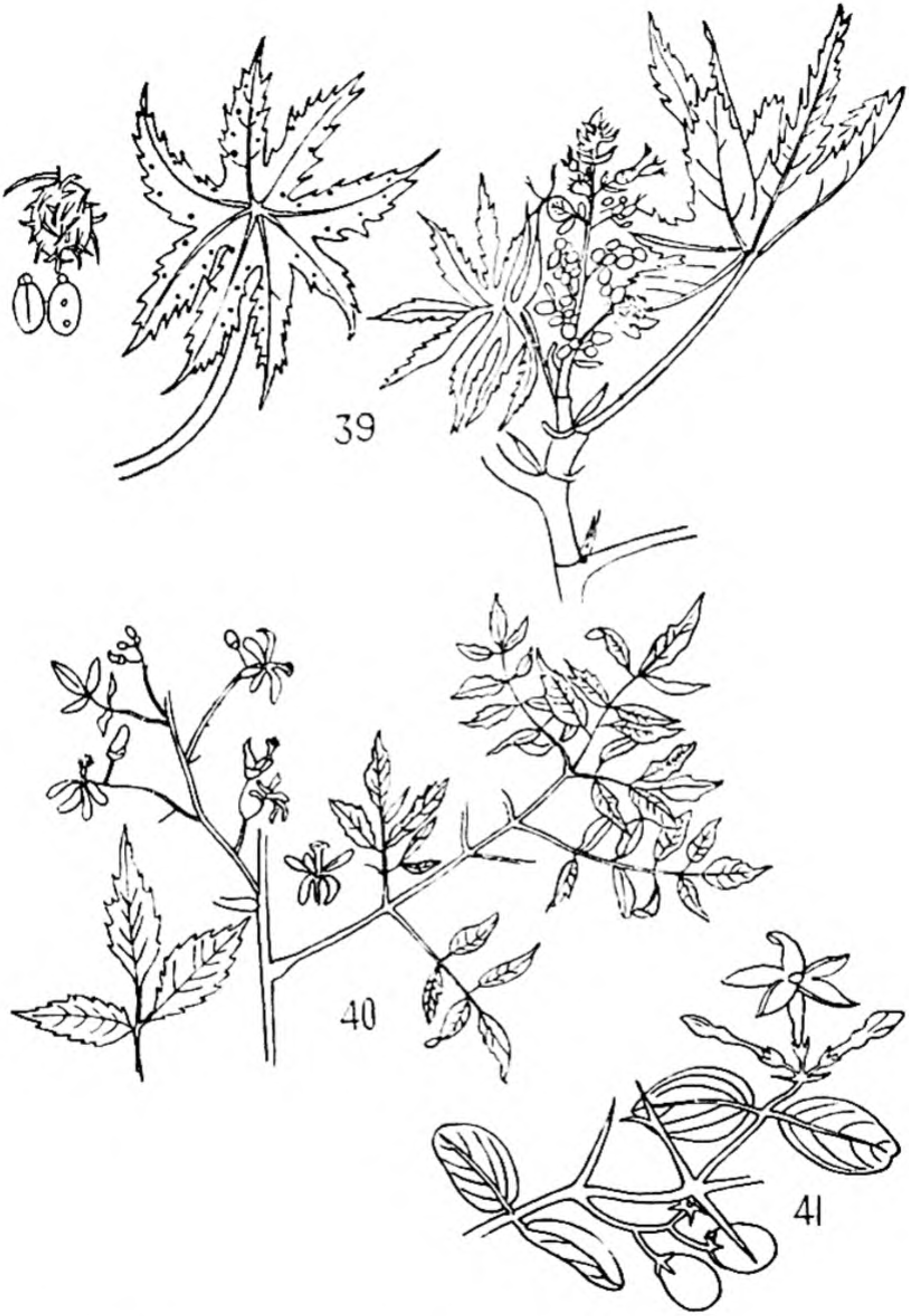
114. DIOSPYROS EBENUM KOENIG.

Family: *Ebenaceae*

Local Names: Abnus, ebans, tendu.

English Name: Ebony Tree.

Description: A large or medium-sized tree; shoots finely pubescent; bark dark grey. Leaves ovate or oblong-lanceolate, up to 5 in. long, slightly leathery, glabrous, green and shining above, paler beneath. Flowers unisexual and bisexual on the same individual; male flowers 3-6 axillary, in shortly stalked



39, Ricinus communis. **40**, Melia azedarach.
41, Carissa carandas.

clusters; calyx pubescent within, corolla pale greenish yellow; female flowers without stalks, solitary; calyx larger than in the male, densely red tomentose within; corolla shorter than in the male; in bisexual flowers calyx as in the female, corolla larger than in the male. Fruit ovoid or globose, 1 in. long, seated on the cup-shaped calyx; seeds 8, black.

Distribution : Chiefly confined to Peninsular India; in the Deccan and Karnatac, Malabar, Mysore, Coorg, Cochin and Travancore.

Uses : This tree is one of the best ebony yielding trees. The central part of the wood is jet black without streaks or markings, and is the true ebony of commerce; the wood is very hard and heavy, takes a good polish, and has a metallic lustre; it is resistant to decay and to attacks of white ants; it is used for cabinet work, ornamental turnery, carving, brush backs, keys of pianos, musical instruments, furniture, parqueting, walking sticks, umbrella handles, fancy articles, rulers, etc. In China the wood is used for chop-sticks, pipes, images, etc. In some places the tree is used as a fish poison.

115. DIOSPYROS EMBRYOPTERIS PERS.

Family : *Ebenaceae*

Local Names : Gab, kusi, makar-tendi, tendu, timburni.

English Name : Wild Mangosteen.

Description : An evergreen, middle-sized tree; bark smooth, dark coloured; young parts clothed with silky hairs. Leaves arranged in two rows, lanceolate-oblong or oblong, 5-9 in. long, leathery, glabrous, shining; leaf-stalk 0.5 in. long, stout, channelled, wrinkled. Flowers unisexual. Male flowers 2-7, in short, pubescent, racemose, drooping cymes; corolla thick, cream-coloured, scented. Female flowers much larger than the male, solitary, axillary, on short drooping stalks. Fruit nearly globose, up to 3 in. diam., yellow, clothed with rusty hairs, seated on the much enlarged leathery calyx. Seers 8, embedded in a viscid pulp.

Distribution : Sub-Himalayan tract from the Jumna to Sikkim, Bengal, Central, Western and Southern India, in wet places and along streams.

Uses: The wood is grey, moderately hard and polishes well; it is used for building purposes, masts of country boats and well construction.

The important part of the tree is its fruit which contains 15 per cent of tannin. In Bengal and Assam an infusion of the unripe fruit is used for tanning fishing nets to make them more tough and durable. The infusion is also used for tanning and dyeing leather. The dye extracted from the fruit varies from light brown to black; and is mainly used for colouring fishing nets and lines, timber, house fencing, and bamboo baskets and cotton. The juice from the young fruit is used in Bengal for paving the bottoms of country boats and for caulking the seams. On the Malabar coast the viscid fruit is extensively employed by carpenters as a glue, and in Europe for bookbinding, as it is an insect repellent. A paint is prepared by boiling the glutinous pulp with or without charcoal. The ripe fruit is edible; the leaves are used as a pot herb.

The bark contains 12 per cent of tannin; it has medicinal uses. The infusion from the unripe fruit and the oil extracted from the seed have medicinal properties.

116. **DIOSPYROS KURZII** HIERN.

Family: *Ebenaceae*

Local Names: Kala-lakri, pecha-da.

English Names: Andamans Marble, Marble Wood, Zebra Wood.

Description: A large, evergreen tree; bark thin, smooth, grey; branchlets, petioles and mid-rib beneath minutely pubescent. Leaves papery, elliptic-oblong, 2-3 in. long. Only female flowers known; 2-3-flowered, short stalked cymes; sepals 4; petals 4, velvety outside. Fruit globose, 0.5 in. diam.

Distribution: Throughout the Andamans; also in the Nicobars and Coco Islands, in semi-deciduous and evergreen forests.

Uses: The wood is hard. It is a variegated ebony, streaked with black and grey, and therefore highly valued for ornamental purposes. In England the timber is used for turnery and for the manufacture of the well-known "Tunbridge-ware." It is also used for furniture.

117. DIOSPYROS MELANOXYLON ROXB.

Family: *Ebenaceae*

Local Names: Abnus, temru, tendu, tumi.

English Names: Coromandel Ebony, Ebony.

Description: A small or moderate-sized, deciduous tree; branches sometimes spinescent; young parts yellowish tomentose. Leaves bitter, alternate, ovate-oblong, up to 6 in. long, thin, leathery, glabrous and shining above, tomentose beneath. Flowers unisexual; male flowers in velvety, shortly stalked, axillary, 3-12-flowered drooping cymes; female flowers solitary, drooping, almost without a stalk. Fruit globose or ovoid, yellow, glabrous, up to 1.5 in. diam.; pulp yellow.

Distribution: Common in the deciduous forests of Madhya Pradesh (the Central Provinces), Bihar, Chhota Nagpur, and Peninsular India.

Uses: The wood is light roseate-grey or roseate-brown with a jet black core—the ebony; the outer light coloured wood is hard and elastic, and the central ebony portion is extremely hard; the outer part is as valuable as the ebony part; both the lighter and darker portions are durable and take a good polish. When the wood is only of pole size it is used for building purposes, shoulder poles, shafts and poles of carts and carriages; the outer lighter coloured wood is used for picking arms and shafts of billiard cues; it is also suitable for tool handles, golf sticks, rover shuttles, carpenters' mallets, croquet mallet shafts, etc. The ebony is used for combs, toys, snuff boxes, carving, fancy work, decorative purposes, scale beams, cabinet and inlay work, brush backs, razor and knife handles, walking sticks, etc.

The leaves serve as plates, and are largely used as wrappers for "bidis." The half ripe fruit has 23 per cent of tannin, but the black ripe fruit has only 15 per cent. The fruit is edible.

118. DIOSPYROS MONTANA ROXB.

Family: *Ebenaceae*

Local Names: Bistendu, lohari, makur-tendi, patwan, tendu.

Description: A handsome, small, deciduous tree, often spinous; branchlets glabrous. Leaves alternate, 2-5 in. long, thin, ovate or oblong, pubescent or glabrous; stalk 0.2 in. long. Flowers unisexual, male and female flowers on different individuals, axillary, shortly stalked; male flowers in cymes, pubescent or glabrescent; female flowers solitary. Fruit 0.5-1.5 in. diam., globose, fleshy, lobes of fruiting calyx foliaceous; seeds 2-8.

Distribution : In the deciduous forests of the Sub-Himalayan tract from the Ravi eastwards, Central, Western and Southern India.

Uses : The wood is grey with dark streaks, moderately hard; it is used for house posts, furniture and carving; it is well suited for match sticks and boxes; it makes good firewood. The fruit is used in Travancore for stupefying fish; in Chhota Nagpur the leaves are used as a fish poison.

119. DIPTEROCARPUS TURBINATUS GAERTN. F.

Family : *Dipterocarpaceae*

Local Names : Ennai, gurjun, kanyin, varungu.

Description : A lofty, evergreen tree, exceeding 200 ft. in height; trunk not glaringly white; bark hard, rough, light grey, fissured longitudinally; young branches compressed. Leaves ovate or ovate-lanceolate, smooth and glossy on both surfaces or slightly pubescent, blade 5-12 in. long; leaf-stalk covered with waxy bloom. Flowers 3 in. diam.; calyx tube hoary pubescent, in fruit 1 in. diam.; petals pinkish white. Fruit body without ribs, but with marked striations, spindle-shaped, with a slight bloom on it; fruit wings 5 in. long.

Distribution : Evergreen forests of Assam, Cachar, Tipperah, Chittagong Hills.

Uses : The tree yields a valuable commercial timber, light red to reddish-brown, which is commonly used for boat building in Chittagong, structural work, railway sleepers, planking, flooring, dugout canoes, oars, helms, bridge decking, tea chests, packing cases, etc.

Another important product of the tree is its oleo-resin, the "gurjan oil" of commerce. This wood oil is extensively used in the manufacture of varnishes and lithographic inks; it also serves as pitch, as a preservative of wood and wicker-work against insect attacks, and of iron against corrosion, and as a waterproofing material for bamboo baskets used as well-buckets; it is useful for caulking and varnishing boats. The oil is of no use in perfumery, but is often used for adulterating essential oils, like that of rose. It is also employed as a substitute for or as an adulterant of copaiba balsam. Torches are prepared by mixing the oil with rotten wood. It has also medicinal uses.

120. DODONAEA VISCOSA (LINN.) JACQ.

Family: *Sapindaceae*

Local Names: Aliar, lutchmi, mendu, wilayti mehndi.

Description: An evergreen shrub or small tree; bark thin, grey, peeling off in long strips; branchlets angular; young shoots and leaves viscid with bright yellow, resinous dots. Leaves alternate, variable, lanceolate to linear-lanceolate, 2-4 in. long, glabrous, leathery; leaf-stalk minute. Flowers in short, terminal panicles or racemes, small, yellow, unisexual and bisexual flowers on the same plant; sepals 5, petals absent; ovary hairy. Fruit a membranous capsule with 2-4 wings. Seeds dark brown or black.

Distribution: Throughout the drier parts of India and Pakistan; Western Himalayas up to 4,000 ft., the Punjab, Sind, Baluchistan, drier regions of Central and Southern India, and in the Nilgiris.

Uses: The wood is hard, yellowish-brown or dark brown; it is reputed to be resistant to white ant attacks; it is used for turnery, engraving, tool handles, walking sticks, firewood, and as food poison.

The leaves and bark contain 9 and 33 per cent of tannin respectively. The leaves are chewed as a stimulant; the leaves and twigs are used for manuring fields in Madras; the crushed leafy twigs are used as torches. The shrub is planted as a sand-binder and for reclaiming marshy land.

121. DUABANGA SONNERATIOIDES HAM.

Family: *Lythraceae*

Local Names: Baichua achung, bandar hulla, bandar kanda, door, kokon, lampati.

Description: A large, deciduous tree. Leaves opposite, oblong, blade 7-15 in. long; stalk stout. Flowers 2-3 in. diam., in terminal corymbs; calyx cup-shaped, segments 6-8, thick, triangular; petals white, crumpled; stamens numerous. Capsules leathery, 4-8-valved; seeds numerous.

Distribution: Sub-Himalayan tract from Nepal eastwards, Bengal, Assam, Manipur, and Cachar.

Uses: The wood is grey or greyish-brown and soft; it takes a good finish and polish; out in the open it is not durable, but is durable in contact with water or under cover; it is an excellent timber for general purposes and is considered to be equal to " toon " (*Toona ciliata*); it is chiefly used for canoes, dugouts and tea chests; and also for planks, light rafters, battens, house building, boats, well construction, cattle troughs and domestic utensils. It is in great demand in Bengal and Assam for tea chests and dugouts.

122. DYSOXYLUM MALABARICUM BEDD.

Syn. D. glandulosum Talb.

Family: *Meliaceae*

Local Names: Agil. bili-devdari, vella agil.

English Name: White Cedar.

Description: A very large tree; bark light coloured, exfoliating in large scales. Leaves 12-18 in. long; leaf-stalk angled, 4-6 in. long; leaflets 9, alternate, ovate, elliptic or lanceolate, leathery, slightly hairy when young, pale coloured, blades 2-9 in. long, stalk of the leaflet very short; hairy glands present in the axils of leaflets. Inflorescence axillary, 4-8 in. long, in slightly hairy panicles, often crowded near the ends of branches; flowers very small, fragrant, shortly stalked. Fruit globose or obovoid, 2-2.5 in. diam., bright yellow, tubercled, with 4 distinct lines.

Distribution : Kanara, Malabar, Coorg, Mysore, Travancore.

Uses : The wood is light brownish-grey at first, later turning darker, lustrous, sweet scented, very durable, not attacked by white ants; its chief use is for making oil casks required for the cocoanut oil industry, it being the only suitable timber for this purpose; it is much used for construction work, bottoms and roofs of carriages, furniture; it is also used for brake-blocks, tea chests, rubber boxes and panelling in railway carriages.

123. ELAEODENDRON GLAUCUM PERS.

Family : *Celastraceae*

Local Names : Aran, burkhas, buta-pala, chawri, jamrassi, tamraj.

Description : A graceful, deciduous tree, variable in size; bark grey or blackish. Leaves glabrous, somewhat leathery, generally opposite, ovate or elliptic, crenate, blade 2-6 in. long. Flowers numerous, small, yellow-brown, in large, axillary dichotomously branched, lax cymes; sepals and petals 4-5 each. Drupes ovoid, 0.5 in. long, yellowish-brown when ripe, stone very hard, bony, 1-2-seeded.

Distribution : Outer Himalayas up to 6,000 ft., Oudh, Madhya Pradesh (the Central Provinces), the Peninsula, and the hotter parts of India.

Uses : The wood is light brown, moderately hard, durable, and takes a good polish. It is suitable for cabinet work, picture frames, combs, and fuel. The roots are regarded as an antidote for snake bite and as an emetic. The bark contains 8-13 per cent of tannin and is reputed to be a virulent poison. It is used to dye cotton fabrics ochre red.

124. EMBLICA OFFICINALIS GAERTN.

Syn. Phyllanthus emblica Linn.

Family: *Euphorbiaceae*

Local Names: Amla, amlika, aonla, avala.

English Name: Emblic Myrobalan.

Description: A small or medium-sized deciduous tree; trunk sometimes gnarled; bark smooth, greenish-grey, peeling off in conchoid scales. Foliage feathery, light green. Leaves 0.5 in. long, narrowly linear, glabrous, closely borne on deciduous branchlets. Flowers small, greenish-yellow, densely clustered along the branches, unisexual, both male and female flowers on the same branchlets; male flowers numerous, on short, slender stalks; female flowers few, stalks minute. Fruit globose, fleshy, up to 0.75 in. diam., with 6 vertical, faint furrows, yellow or pink when ripe, 6-seeded.

Distribution: A native of tropical and sub-tropical India and Pakistan. Common in Uttar Pradesh (the United Provinces).

Uses: The wood is dull red or reddish-brown, hard, mottled, flexible and tough. It is used for cheap buildings and furniture, well construction, agricultural implements, gun-stocks, turnery and fuel. Hookas and "country" pipes are also made from the wood.

The leaves and fruit contain 22 and 28 per cent of tannin respectively; the bark from the trunk contains 8-9 per cent of tannin, but that from the tender twigs contains 21 per cent. They are used for tanning leather in many parts of India and Pakistan. Silk is dyed in beautiful light brown colours with the dye obtained from the leaves and the fruit; the colour is turned to black with sulphate of iron as a mordant. The dye is not suitable for cotton. The fruit is edible and can be made into a preserve. The dried fruit is used as a shampoo for the head, and is an ingredient in the making of ink and hair dyes. The twigs and chips of wood are used to clarify muddy water.

Amla is a useful coppice tree; the leaves and fruits are also useful as fodder for cattle; the branches are lopped for leaf manure.

125. ERVATAMIA DIVARICATA BURKILL

Syn. E. coronaria Stapf.

Family: *Apocynaceae*

Local Names: Bara-taggar, chandni, firki-taggar, taggar.

English Names: East India Rosebay, Nero's Crown, Wax Flower.

Description: An evergreen, glabrous shrub; branches dividing in pairs; bark grey. Leaves opposite, membranous, elliptic-oblong, glossy green above, paler beneath, margins undulate, blade 4-6 in. long. Flowers in small cymes at the forking of branches, pure white, fragrant at night; corolla salver-shaped. Follicles ribbed, 2, red inside, 2 in. long, 3-6-seeded.

Distribution: Indigenous in the foot-hills of the Himalayas; throughout India and Pakistan.

Uses: The wood is fairly hard and white; it is burnt as an incense and used in perfumery. It is also used as a refrigerent. The red pulp of the fruit yields a dye which colours fabrics red.

The root is used as an antidote against scorpion bites; it has also other medicinal uses. The charcoal from the stem is also used medicinally.

126. ERYTHRINA SUBEROSA ROXB.

Family: *Leguminosae*

Local Names: Dholdak, madar, pangra, panjira, sambar.

Description: A moderate-sized, deciduous tree, bark light grey, corky, deeply cracked; branches numerous, crooked, covered sparingly with stout, conical, yellowish-white prickles which drop off after the third year. Leaves 3-foliate, usually unarmed, densely pubescent beneath; leaflets 3-6 in. long and broad, broadly ovate or rhomboid, entire or sinuate. Racemes terminal, in dense heads; calyx 2-lipped, not splitting to the base; corolla scarlet. Pods stalked, 5-6 in. long, cylindrical, slightly constricted between the seeds, when young filled with spongy tissue between the seeds; seeds 2-5, pale brown or black, dull, kidney-shaped.

Distribution : Throughout the dry forests of India and Pakistan; wild in the Siwalik tract and lower Himalayas.

Uses : The wood when first cut is white, but ages to dull yellow or pale yellowish-grey; it is extremely light, soft and spongy, but tough; it is commonly used for making jars of large dimensions, scabbards, drums, sieve-frames, water troughs, lacquer boxes, cheap tea chests and packing cases especially for fruits. The bark has been found to be the best material for the manufacture of composition cork plugs, and sheets which can be useful as insulation boards.

127. ERYTHRINA VARIEGATA LINN.

Syn. E. indica Linn.

Family : *Leguminosae*

Local Names : Dadap, dap-dap, dholdak, panarweo, pangra, panjira.

English Names : Coral Tree, Mochi Tree.

Description : A medium-sized, deciduous tree; trunk straight; branches numerous; branchlets and stem armed with conical, dark coloured prickles, which fall off after 2 or 3 years; young shoots and inflorescence pubescent; bark thin, yellowish or greenish-grey, smooth, shining, longitudinally cracked, exfoliating in papery flakes. Leaves 3-foliate; leaflets entire, membranous, hairy when young, hairless when mature, terminal leaflet larger than the other two. Flowers large, numerous, of a bright, dazzling scarlet, in dense racemes, 4-9 in. long, at the ends of branchlets, arranged in clusters, 1-3 blooms arising from a common stalk. Pods many on a stout stalk, thick, 6-12 in. long, distinctly constricted between the seeds, black; seeds 1-12, oblong, smooth, large dark red or purple or brown.

Distribution : Throughout India and Pakistan.

Uses : The wood is soft, white, light and durable; it is known as " mochi wood," and is used for boxes, toys, scabbards, light planking, tea chests, boat building, models, frames for sieves, jars, and firewood. In Siam the powdered wood is made into a face powder.

A red dye is extracted from the flowers. The bark is used for tanning and dyeing; a fibre is extracted from the bark which is suitable for cordage. Young leaves serve as a pot herb, and mature leaves as fodder.

The tree is very often planted to serve as shade for coffee and tea, and as support for betel and pepper vines. It makes a good cattle-proof hedge.

The bark and the leaves have medicinal uses.

128. EULALIOPSIS BINATA (RETZ.) C. E. HUBBARD

Syn. Pollindium binatum (Retz.) C. E. Hubbard

Family: *Gramineae*

Local Names: Babni, baggar, baib, ban-kush, bhabar, sabai.

Description: A perennial, tufted grass; stem 2-3 ft. high, straw-coloured, woolly at the base, erect, slender, sparingly branched, glabrous. Leaves mostly in large tufts at the base, 1-2 ft. long, very narrow, rigid, sharply pointed. Racemes 2-4, on axillary or terminal; stalks very slender, 1-2 in. long, erect, clothed with golden or rusty hairs.

Distribution: Lower Himalayas from Kashmir to Sikkim, on bare slopes and forest blanks; common in Bihar, Utkal (Orissa), Bengal, Central India and the Punjab.

Uses: It is one of the most important plants of India and Pakistan for the manufacture of paper, for which it is chiefly used; rough ropes, strings and mats are made out of this grass; the well-known "bhabar" mats of Shahjahanpur (Uttar Pradesh) are woven out of this fibre.

129. EUPHORBIA CATTIMANDOO W. ELLIOT

Syn. E. trigona Haworth

Family: *Euphorbiaceae*

Local Name: Cattimandu.

Description: An erect, glabrous, fleshy shrub, 6-7 ft. high; branches twisted winged; wings lobulate with 1 or 2 pairs of spines. Leaves from the sides of the wings, 1-2 in. long, deep green above, paler beneath, fleshy, obovate-spatulate, solitary between the spines, tips rounded. Flower cymes solitary, shortly stalked; flowers unisexual, male and female on the same individual.

Distribution: Common in Vizagapatam and dry rocky hills in the Deccan.

Uses: Cattimandu is a valuable plant for the cement that is prepared from its milky juice; the cement is prepared by boiling the juice from the branches; it is used for fixing knives into handles and other similar purposes. The boiled and solidified juice can also be moulded into useful and fancy articles.

130. FERONIA LIMONIA (LINN.) SWINGLE

Syn. F. elephantum Correa.

Family: *Rutaceae*

Local Names: Bilin, cawtha, kaitha, kath-bel.

English Names: Elephant Apple, Wood Apple.

Description: A moderate-sized, deciduous, glabrous tree, armed with strong, straight axillary spines; bark dark grey, rough, thick and wrinkled. Leaves aromatic, alternate; stalks of leaves and leaflets flat and often winged; leaflets 5-7, opposite, entire. Flowers 0.5 in. across, dull red or whitish, in loose, lateral or terminal, leaf-bearing panicles, usually bisexual. Fruit globular, 3 in. diam.; rind woody, hard, grey, rough; seeds numerous, embedded in a fleshy pulp.

Distribution: Throughout India and Pakistan in dry open forests.

Uses: The wood is yellowish-white, heavy, strong, hard, and durable; it is used for house building, naves of wheels, agricultural implements, oil-mills, ornamental carving, etc.

The gum that exudes from the trunk is white and transparent; it is used as a substitute for gum arabic, for making artists' water colours, dyes and varnishes. A yellow ink is prepared by mixing the sap with orpiment; it is used by the Siamese for writing on palm leaves.

The fruit is edible; it is made into a preserve, chutney, and sherbet. The woody shell of the fruit is converted into fancy articles, like snuff boxes, trinket boxes, etc.

The leaves have the aroma of aniseed and are used as a carminative. The fruit also has medicinal uses.

131. FICUS BENGHALENSIS LINN.

Family: *Moraceae*

Local Names: Bargat, bor, bur, but, wur.

English Name: Banyan Tree.

Description: A large, evergreen tree, epiphytic when young; branches spreading, sending down numerous aerial roots, which enter the ground and form trunks; bark smooth, grey, exfoliating in small, irregular plates. Leaves alternate, leathery, glabrous when mature, ovate, 4-8 in. long, entire. Figs (receptacles) without stalks, in axillary pairs, globose, downy, red when ripe, up to 0.75 in. diam.

Distribution: Indigenous in Sub-Himalayan tract and Indian Peninsula; found throughout India and Pakistan.

Uses: The wood is grey, moderately hard, and durable under water. The wood of the trunk formed by the aerial roots is stronger than that of the main stem. The timber is used for well-curbs, common furniture, boxes, doors of huts, door panels, pestles, cart shafts, yokes, etc. The aerial props are particularly preferred for tent poles, poles for palanquins and muncheels, cart yokes, carrying shafts and umbrella handles.

The fibre extracted from the bark and aerial roots is utilized for making coarse ropes, slow matches and inferior kind of rubber. The bark is also employed for making paper. The milky, viscous juice makes a very good bird-lime and is also used for filling up painful cracks in the soles of the feet. In Lahore it is also utilized for the oxidation of copper.

The leaves are joined together to make plates. Tender leaves and shoots, the bark and fruits are eaten, especially in times of scarcity.

The various parts of the tree, including the milky juice, are of much medicinal value.

The tree is sacred to the Hindus.

132. FICUS GLOMERATA ROXB.

Family: *Moraceae*

Local Names: Gular, umar.

Description: A large tree without aerial roots; branchlets glabrous; bark thick, brownish-grey, rather smooth, scaly. Leaves ovate-oblong to lanceolate, 3-8 in. long, thin, glabrous, shining on both surfaces. Figs (receptacles) on short, leafless, warted branches, sub-globose or pyriform, smooth or pubescent, about 1.5 in. diam., red when ripe.

Distribution: Throughout tropical India and Pakistan.

Uses: The wood is greyish-white or reddish-grey, soft, very light, not durable, but lasts fairly well under water; it is used for cheap furniture, doors of huts, well construction, rough planking, tea chests, cart yokes and axles, carved images, toys, oars, coopers' work, rice pounders, inferior type of wood pulp, bellows, ploughs, fuse-box fittings, and cotton reels.

Bird-lime is made out of the viscid, milky juice. The fruit is edible. The tree is sacred to Hindus (kunbis).

The leaves, bark, fruit and juice are used in local medicine.

133. FICUS RELIGIOSA LINN.

Family: *Moraceae*

Local Names: Asud, asvatha, pipal, pipro.

English Name: The Pipal Tree.

Description: A large, glabrous, deciduous, usually epiphytic tree, without aerial roots; bark fairly smooth, pale grey. Leaves alternate, leathery, ovate-round, tip narrowed into a long tail, about half the length of the blade, rounded at the base, blade 4-7 in. long, margins entire, undulate, shining and not tubercled above, paler and minutely tubercled beneath when dry; young foliage flushed with pink. Figs (receptacles) in axillary pairs, depressed-globose, 0.25 in. diam. without stalks, smooth, dark purple when ripe

Distribution: Wild in Sub-Himalayan forests, Bengal and Central India.

Uses: The timber is light, greyish-brown, greyish-white or yellowish-white, fibrous and of inferior quality; it is little used but occasionally converted into packing cases, fuel, cheap boarding, yokes, and felloes of wheels. The bark yields a fibre which is made into ropes; in Burma the bark was at one time used for making paper. The bark contains some tannin and is used occasionally for preparing leather and for dyeing. The viscid, white latex from the tree is prepared into a bird-lime, used as a sealing wax and as a filling material for cavities of hollow ornaments. The roots in conjunction with alum are employed to dye cotton fabrics a pale pink colour.

The leaves and branches are commonly used as fodder; young leaf buds and figs are eaten.

It is one of the most sacred trees of the Hindus and Buddhists.

It is one of the hosts of lac insects.

The tree has many medicinal uses.

134. FLEMINGIA SEMIALATA ROXB.

Family: *Leguminosae*

Local Names: Bara-salpan, bhalia, cusunt, dowdowla, supta.

Description: A tall, handsome flowered shrub; branches angular, with grooves. Leaf-stalk angular, sometimes winged; leaflets 3-12 in. long. Racemes dense, oblong, often fasciculate. Pods 0.5 in. long, brown, pubescent; seeds 2, black.

Distribution: Sub-Himalayan tract from the Jumna eastwards, Khasi Hills, Chittagong, Uttar Pradesh (the United Provinces) and Peninsular India.

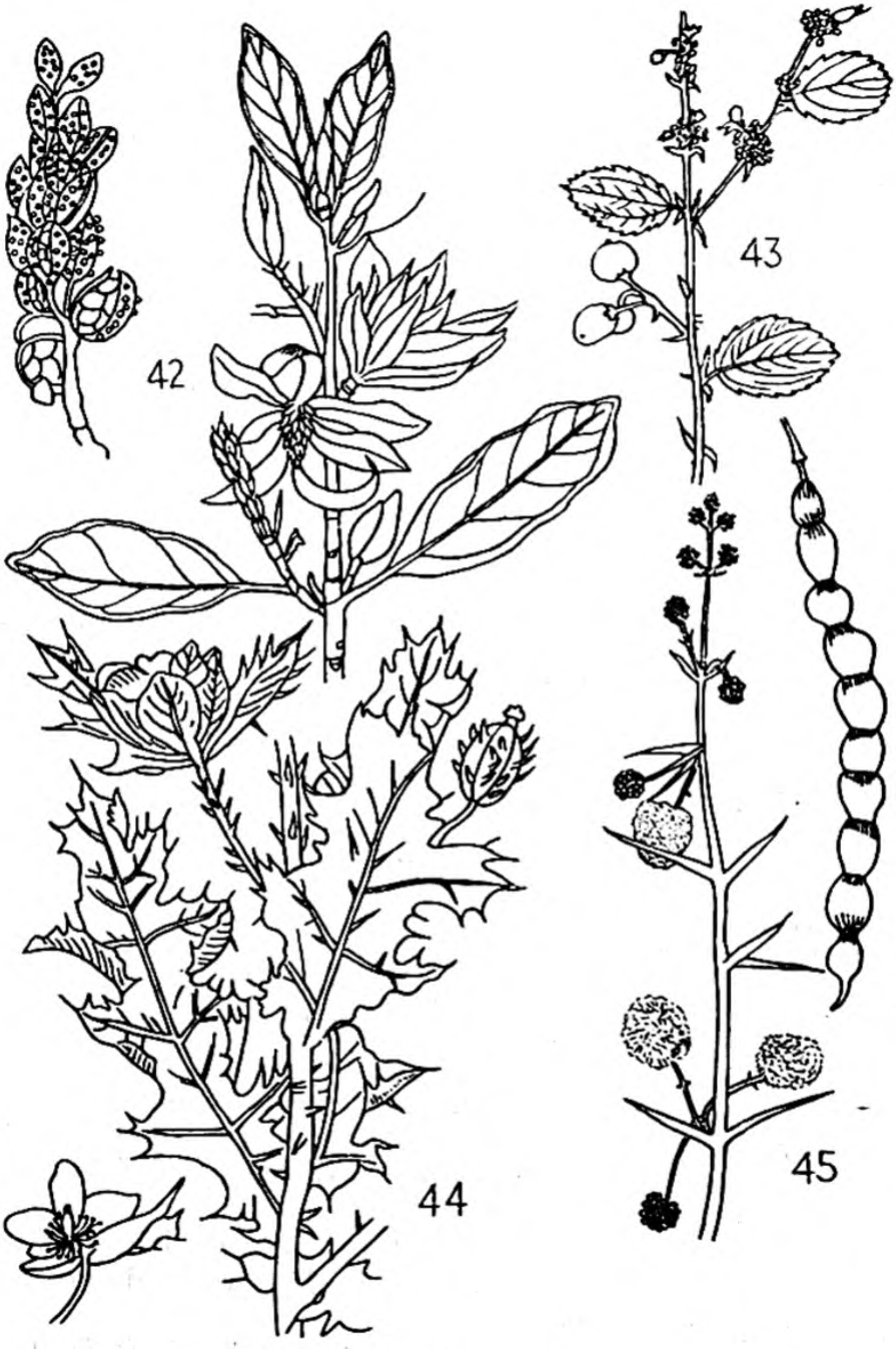
Uses: The pods are valuable for the dye, "waras," they contain; like "kamela" (***Mallotus philippinensis***) it is highly prized for dyeing silk; it is, however, not suitable for linen or cotton. "Waras" turns brown with an alkaline solution. The pods are edible.

135. GARCINIA INDICA CHOIS.

Family: *Guttiferae*

Local Names: Amsal, bhirand, kokum.

English Names: Brindonia Tallow Tree, Kokum Butter Tree, Mangosteen Oil Tree.



42, Michelia champaca. **43,** Zizuphus jujuba. **44,** Argemone mexicana. **45,** Acacia scorpioides.

Description : A tall, graceful, slender tree, branches drooping; branchlets black, usually buttressed at the base; bark thin, shiny, shallow fissured. Leaves ovate, obovate, oblong-lanceolate, 2-4 in. long, glabrous, dark green above, pale beneath, red when young, thickly membranous, thin when dry. Flowers bisexual; male flowers 2-8 clustered; flower-stalk stout; female flowers usually solitary. Fruit globose, 1.5 in. diam., not grooved, deep purple; seeds large, 5-8.

Distribution : Endemic in the Western Ghats, Malabar, the Konkan, and many parts of Madras.

Uses : The tree is commercially useful because of its fruit. The well-known kokum butter or mangosteen oil of commerce is extracted from the seeds; this butter or oil contains 52 per cent of stearic acid, which can now be extracted in a pure form; this acid is used in cosmetic, textile, soap, and other industries where stearic acid only in its pure form is required to be used. Kokum butter is used in the preparation of ointments and as a substitute for cod-liver oil. The juice of the fruit is used as a mordant in dyeing. The peel is used in cookery and for making beverages.

Kokum butter has medicinal uses.

136. GARCINIA MORELLA DESR.

Family : *Guttiferae*

Local Name : Tamal.

English Name : Gamboge Tree.

Description : A small, evergreen tree. Leaves leathery, 4-6 in. long, elliptic-obovate to ovate-lanceolate. Flowers unisexual and bisexual; male flowers about 3 in. across, in the axils of fallen leaves; flower-stalk up to 0.25 in. long; stamens numerous; female flowers larger than the male, solitary, axillary; stalk, if present, very short. Fruit size of a cherry, roundish, slightly 4-lobed, 4-celled, 4-seeded.

Distribution : In the forests of East Bengal, Khasi Hills, the Western Ghats from South Kanara to Mysore and Travancore, and the Eastern Peninsula.

Uses : The wood is yellow, mottled and hard; it is used for cabinet making.

The true gamboge of commerce is the gum-resin that exudes from this tree; it is utilized for dyeing yellow silk fabrics, especially of Buddhist priests; the Hindus use it as a "tilak" for marking their foreheads; artists employ it as a pigment for their water colour drawings.

The rind of the fruit is used as a tan. The seeds contain a yellow-coloured fat, which serves as a luminant, and as a substitute for ghee.

The gum-resin has medicinal uses.

137. GAULTHERIA FRAGRANTISSIMA WALL.

Family: *Ericaceae*

Local Names : Jirhap, jirhapiong, wel-kapuru.

Description : A stout shrub; branches triangular. Leaves alternate, toothed, lanceolate to ovate, 3 in. long, leathery, glabrous or sparingly hairy on the under surface. Racemes pubescent, 1-3 in. long; flowers stalked, small; corolla broadly tubular, green, green-yellow or whitish. Fruit 0.2 in. diam., brown, hairy, surrounded by the deep blue, enlarged calyx.

Distribution : Nepal to Bhutan at 6,000-8,000 ft., Khasi Hills; common in East India, the Nilgiris, the Western Ghats, the Pulney Hills, hills of Travancore.

Uses : The herb contains an essential oil, winter-green oil; salicylic acid is obtained from this oil which is used in the preparation of aspirin. Carbolic acid is also prepared from this oil. The oil is an excellent antiseptic and is much used in the manufacture of many insecticides and insect repellents. It has medicinal properties.

138. GERANIUM NEPALENSE SWEET.

Family: *Geraniaceae*

Local Name : Bhanda.

English Name : Nepalese Crane's-bill.

Description : A slender, prostrate, much-branched, softly hairy, perennial herb, 6-8 in. high; branches rooting at the joints. Leaves up to 3 in. long, orbicular, palmately 3-5-lobed; segments equal or nealy so, irregularly lobed and toothed. Flower-stalks usually slender, variable in length, sometimes 1-flowered; flowers up to 0.75 in. diam., pink, purple or pale purple; sepals usually silky; petals slightly notched. Fruit hairy; seeds smooth, shining.

Distribution : Common throughout the temperate Himalayas, 5,000-9,000 ft., Khasi Hills, the Nilgiris and Pulney Hills, usually above 6,000 ft.

Uses : The root is of commercial importance; a dye is extracted from it, which is used as a substitute for "manjit" (***Rubia** cordifolia*). The root has astringent properties and is also used as a tan.

139. GERANIUM WALLICHIANUM D. DON.

Family : *Geraniaceae*

Local Names : Kao-ashud, lal jahri, mamiran.

English Name : Wallich's Crane's-bill.

Description : A perennial, hairy, erect, much branched, 1-4 ft. high plant with a thick root-stock and a robust stem. Leaves opposite, rounded, 2-5 in. across, palmately 3-5-lobed; segments wedge-shaped, pointed, toothed. Flowers up to 2 in. across, blue-purple to red-purple, borne on long stalks each bearing 2 flowers; petals 5, slightly notched, lower part hairy. Fruit hairy.

Distribution : Indigenous in temperate Himalayas from Kashmir to Nepal at 7,000-11,000 ft., Kurum Valley from 8,000-10,000 ft.

Uses : The roots contain a high percentage of tannin, 25-32 per cent, similar to that of myrobalans and oak-galls. This plant is a valuable addition to our indigenous tanning materials. Leather tanned with this material is as good as that tanned with canaigre root (***Rumex hymenosepalum***), but is slightly darker in colour. In Kashmir the roots are much used in dyeing. They are astringent and are employed in arts and medicine.

140. GIRARDINA HETEROPHYLLA DCNE.

Syn. Urtica heterophylla Roxb.

Family: *Urticaceae*

Local Names: Agia, alla, awa, bhabar, bichua.

English Name: Nilgiri Nettle.

Description: A tall, stout, coarse, erect herb, 4-6 ft. high, clothed with very long, stout, stinging hairs; roots perennial; stem and branches furrowed. Leaves large 4-12 in. long, broad cordate, variously lobed, often palmately, coarsely toothed; leak-stalk 4-6 in. long. Flowers unisexual; male and female flowers on the same plant; male cymes below, loosely paniculate; female above, in clusters. Fruiting cymes elongate, lobulate; achenes broadly ovate, punctuate, black.

Distribution: Common in temperate and sub-tropical Himalayas, up to 5,000-ft.; in Assam, Sylhet, Central India to Southern Peninsula from 1,000-5,000 ft.

Uses: A strong, durable, soft, beautifully white and silky fibre is obtained from the plant; the fibre is 6-20 in. long, resembles ramie fibre (*Boehmeria nivea*) or flax (*Linum usitatissimum*) though it is coarser and less lustrous; it is rich in cellulose and resists the action of alkali; at present it is used for making gunny bags, coarse cloth and similar articles, especially in Assam, but some are of opinion that it might take a high place amongst textile fibres. In the Nilgiris the Todas use the fibre as thread material.

141. GMELINA ARBOREA LINN.

Family: *Verbenaceae*

Local Names: Gomari. gumhar, khamara, kumar, shewan.

English Names: Candahar Tree, Coomb Teak, Kashmir Tree.

Description: A moderate-sized or large, deciduous tree; trunk straight; bark smooth, greyish-yellow or whitish; young parts tomentose. Leaves opposite, broadly ovate or cordate, entire or dentate, glabrous above when mature, yellow tomentose beneath, 3-6 in long, leaf-stalk 2-3 in long, glandular at the top. Flowers in a terminal yellowish tomentose panicle; calyx yellowish tomentose; corolla brownish-yellow, pubescent outside, lobes 5, 2-lipped, 1.5 in. long. Drupes yellow when ripe, ovoid or pyriform, 1 in. long.

Distribution : Scattered over a large part of Tropical and Subtropical India and Pakistan, up to 5,000 ft. in deciduous forests.

Uses : The wood is light yellowish-brown or white, light, strong, durable, with a glossy lustre, of excellent quality; it is one of our best and most reliable timbers; it can be easily painted and varnished. It is used for a variety of purposes, especially for planking, furniture, cabinet work, panelling, carriages, palanquins, shafts, axles, yokes, agricultural implements, well construction, grain measures, decks of boats, cattle-bells, toys, lacquered boxes, sandals, clogs, ornamental carving and picture frames. In Assam the timber is particularly in demand for making dugouts, and in Chittagong for boat and ship building. The timber is much used for making Indian sitars and similar other musical instruments, drums and tom-toms. The wood also finds uses in the manufacture of matches; it is particularly suitable for match sticks, inside boxes and peeling purposes. Pearl ash or potash salts are prepared from the wood.

The Santals employ the wood ashes and fruits as dyes.

The fruit is eaten by Gonds and Bhils, the young shoots by cattle and deer.

The bark, root and fruit are of medicinal value.

142. GREWIA ELASTICA ROYLE.

Syn. G. vestita Wall.

Family: *Tiliaceae*

Local Names : Bimlau, dhamun, hasa dhamin, khursi, pharsia, pharsuli.

Description : A small tree, young parts tomentose. Leaves ovate or elliptic, finely toothed, base oblique or rounded, underside white tomentose. Flowers yellow, flower-stalks rather stout, tomentose, almost the same length as of the leaf-stalk, buds oblong. Fruit globose, size of a pea, hairy.

This species is very variable and has a series of forms.

Distribution : Sub-Himalayan tract from the Indus eastwards, Bengal, and Central India.

Uses: The wood is greyish-white, elastic, hard and very tough; it is known for its strength and elasticity; it is considered to be superior to ash, though slightly inferior to hickory in strength qualities. It is in great demand for purposes requiring toughness and lightness; it is used for articles which are commonly made of ash, beech, maple, and hickory. It is therefore particularly valuable for tool handles of all sorts, picker arms and other parts of textile machinery, buggy shafts, plough shafts, shoulder poles, spokes of wheels, agricultural implements, police batons, water scoops, oars, bows, furniture, tennis racket frames, etc.

The berries are edible and make excellent sherbets. The branches are lopped for fodder.

143. GREWIA SUBINAEQUALIS DC.

Syn. G. asiatica Linn.

Family: *Tiliaceae*

Local Names: Dhamin, phalsa.

Description: A large straggling shrub or a small tree; bark greyish-white or greenish-brown; branchlets and underside of leaves varying from glabrous to densely and softly tomentose. Leaves broad cordate to obliquely ovate, coarsely and irregularly toothed, 2-7 in. long; leaf-stalk yellow pubescent. Main flower-stalks axillary, grey tomentose, in clusters of 2-10, varying in length, each bearing 3-5 flowers; sepals yellowish, glabrous within, grey-tomentose without; petals yellow or red and yellow. Fruit globose, size of a pea, fleshy, indistinctly lobed, dark brown.

Distribution: Indigenous in parts of Bombay State, Salt Range and Oudh; common in Peninsular India; cultivated in many places in India and Pakistan.

Uses: The wood is yellowish-white, light, strong and elastic; it is used for purposes requiring elasticity and lightness, such as bows, shoulder poles, spear handles, etc.

The bark yields a fibre which is suitable for rope making; the bark is also employed for clarifying sugar.

The fruit is edible; it is used for the distillation of a spirituous liquor and for making pleasant beverages.

144. GREWIA TILIAEFOLIA VAHL.

Family: *Tiliaceae*

Local Names: Dhamani, phalsa.

Description: A large, deciduous tree; bark ash-grey, exfoliating. Leaves usually ovate, toothed, pubescent or glabrous above, tomentose, often white beneath, blade 2-5.5 in. long. Flowers small in axillary umbels; stalks 3-8-clustered, 3-flowered; buds ovoid grey-tomentose; sepals glabrous, white tomentose outside and yellowish within; petals ovate, yellow, turning purple, shorter than the sepals; stamen filaments purple. Berries 2-4 lobed, size of a pea, black; seeds numerous.

Distribution: Sub-Himalayan tract from the Jumna to Nepal, and throughout Central and Southern India.

Uses: The wood is brown, hard, tough, elastic, durable, and takes a good polish and is extensively used. It is converted into boats, masts, oars, shafts, tent poles, plough yokes, agricultural implements, shoulder poles, tool handles, fishing rods, door and window frames, furniture, bent parts of carriages and carts, spokes, felloes, and pellet-boxes; it is also very suitable for coopers' work, golf clubs, billiard cues, athletic equipment like trapeze and parallel bars, picker-arms in textile mills, shuttles, warper bobbins, cotton tubes and pirns. A coarse, strong, yellow-brown fibre is extracted from the bark suitable for cordage.

The leaves and twigs are lopped for fodder; the leaves contain 11 per cent of tannin. The fruit is edible.

The bark and the wood have medicinal uses.

145. GUAZUMA TOMENTOSA KUNTH.

Family: *Sterculiaceae*

Local Name: Rudraksha.

English Name: Bastard Cedar.

Description: A middle-sized tree, soft parts tomentose; bark rough, brown; branches often gnarled. Leaves oblong-lanceolate or obliquely cordate, 3-4.5 in. long, margins serrate, base unequal-sided, rough or glabrescent above, pubescent beneath; stalk short. Flowers numerous, bisexual, small, yellow and purple, in many-flowered panicles; flowers in globose heads. Capsules ovoid, woody, 1 in. long, covered with obtuse, black tubercles.

Distribution : A native of tropical America; common in warmer parts of India and Pakistan.

Uses : The wood is light, coarse, fibrous, pale brown in colour and takes a good polish; it is used for furniture, panelling, and packing cases.

The bark contains a lot of mucilage; it is used for clarifying sugar in Mauritius and the West Indies. The bark yields a strong fibre, which can be made into ropes.

The fruit is sweet and mucilaginous; it is edible.

The bark has medicinal properties.

146. HARDWICKIA BINATA ROXB.

Family: *Leguminosae*

Local Names : Acha anjan, passid.

Description : A moderate-sized or large deciduous tree; bark thick, rough, dark-grey, peeling off in narrow flakes; branchlets slender, drooping; foliage grey, feathery. Leaves alternate, 2-foliate; leaflets without stalks, entire, obliquely ovate, leathery, pale dull grey-green, glabrous, 1-2.5 in. long. Flowers in long, slender racemes arranged in terminal panicles; sepals distinct, membranous, petal-like, yellowish-green in colour. Pods strap-shaped, narrowed at both ends, 2-3 in. long, compressed, glabrous, opening at the apex. Seeds near the top of the pod.

Distribution : Very common in dry savannah forests of Southern and Central India and southern parts of Uttar Pradesh (the United Provinces).

Uses : The wood is dark red, durable, tough, and excellent as a general utility wood; it takes a good polish; it is one of the hardest and heaviest of Indian woods; it is so hard that in some places, in an emergency, it has been used as a substitute for brass for bearings of machinery. The timber is very valuable for pile wood; it is in great demand for house building, bridge posts, beams, carts, clod-crushers, ploughs, hand-looms, well construction, carving, turning, ornamental work, oars, agricultural implements, bench-screws, lathe chucks, blocks for wood engraving, carpenters' tool handles, etc.

Narrow bands of red-brown fibre can be readily stripped off from the bark; the fibre is strong and is chiefly used for cordage and rope making. The bark is also valuable as a tanning material.

An oleo-resin exudes from the stem; the gum is valuable as a wood preservative, especially in Kanara and Mangalore; and is applied to doors, windows, rafters, pillars, and ceiling planks.

The leaves are much used as fodder for cattle and horses.

147. HEDYCHIUM SPICATUM HAMILT.

Family: *Zingiberaceae*

Local Names: Kachri, kachur, kapur, sir.

Description: Root-stock horizontal, tuberous; root fibres not much thickened; stem elongate, leafy. Leaves oblong or oblong-lanceolate, up to 1 ft. or more long, variable in breadth. Spikes dense flowered, bracts large, oblong, green, 1-1.5 in. long; flowers ascending, white, 2-2.5 in. long, filaments pale red. Capsules glabrous, globose.

Distribution: Sub-Himalayan forests from 3,500-7,500 ft., Nepal, Kumaon.

Uses: The useful part of the plant is the aromatic root-stock; it is chiefly used as a perfume and in the preparation of "abir" which Hindus use in their religious ceremonies; it is also an insect repellent and as such is used for preserving clothes. Employed as an auxiliary in dyeing it imparts a pleasant smell to the fabric. In Uttar Pradesh it is used with "henna" (*Lawsonia inermis*) to produce the shade, "malagiri." The pounded root is mixed with tobacco in some places and smoked in hooka.

The hill tribes make mats out of the leaves. The fruit is used for softening tough meat and in the cooking of lentils.

The root-stock has medicinal properties and is chiefly used in veterinary medicine.

148. HELECTERES ISORA LINN.

Family: *Sterculiaceae*

Local Names: Bhendu, dhamni, jonka-phal, marophali, muradsing, murrori-ka-jhar.

English Name: East India Screw Tree.

Description : A shrub, clothed with rough tomentum. Leaves in two rows, obovate or obliquely cordate, irregularly toothed, rough above, pubescent beneath, blade 3-5 in. long. Flowers 2-6 together in short, few-flowered, axillary cymes; calyx 2-lipped, compressed, 5-toothed, brown pubescent; petals red, 2 broader than the others. Fruit consisting of 5, beaked, tomentose, spirally twisted follicles.

Distribution : Southern and Central India; common on the Western Ghats.

Uses : The shrub is known for the fibre contained in its inner bark; the fibre is light brown or greenish, soft, silky and beautifully lustrous; it is valuable because it does not decay when exposed to damp; like "pat" or jute it turns brown with age but does not deteriorate so quickly and is stronger. In Southern India the fibre is used for sacking and for tying up rice bundles; in many parts it is the chief material for making bags for carrying rice, areca nuts and other produce. In Travancore the fibre is utilized for making parti-coloured canvas, locally known as "viries."

The fruit is used in indigenous medicine.

149. HERITIERA FOMES BUCH.-HAM.

Syn. **H. minor** Roxb.

Family : *Sterculiaceae*

Local Names : Sunder, sundri.

Description : A moderate-sized, evergreen tree; trunk deeply grooved. Leaves broadly lanceolate. 4-6 in. long, ashy beneath, scaly, leathery. Flowers in axillary, crowded, much branched, rusty pubescent, 2-3 in. long panicles; flowers small, orange coloured, bell shaped, unisexual. Fruit woody, flattened, furrowed on the inner edge, winged on the outer, not splitting open.

Distribution : Native of tidal forests; common in the Sunderbans, some parts of the Chittagong Range, along the coast of the Eastern Peninsula.

Uses : The wood is dark red, very hard, strong, tough, elastic, and durable both on land and under water; it is extensively used as pile wood, as pit props in mines and for heavy construction work; in the Gangetic Delta the wood is in great demand for boat-building; on the Hooghly country boats are chiefly made of "sundri"; the timber is also converted into oars, helms, masts, spars, buggy shafts, cart axles, and rafters. The wood is also used in well-construction, for making bows of string instruments like violin, "sitar," etc., and as firewood. "Sundri" charcoal is excellent and is used specially for gunpowder.

The tannin contents of leaves and bark are high; the leaves contain 11 per cent, and the bark of the trunk and mature branches 9 per cent, whereas the twig bark has 12 per cent of tannin.

150. HIBISCUS ABELMOSCHUS LINN.

Family: *Malvaceae*

Local Name: Mush-dana.

English Name: Musk Mallow.

Description: An annual, herbaceous shrub, 2-3 ft. high, clothed with minute bristles. Leaves variable in shape, 5-7-lobed, lobes spreading, oblong-lanceolate, coarsely toothed. Flowers axillary; stalk 2 in. long; corolla 4 in. diam., yellow with a crimson centre. Capsules oblong-lanceolate, slightly hairy, 1-3 in. long. Seeds musky scented.

Distribution: Common throughout the hotter parts of India.

Uses: The stem yields a fibre suitable for cordage; the fibre can be used as a substitute for jute.

The seeds have a musky odour, the odorous principle being present in the seed coat; they are used in perfumery under the name of "grains d'ambrette," and for making cheap sachet powders for placing amongst clothes as insect repellents. They are also used in cosmetics and to scent the hair. The essential oil obtained from the seed chiefly consists of farnesol.

The leaves are used in Uttar Pradesh (the United Provinces) for clarifying sugar.

The roots contain a mucilage which is employed in China for sizing paper.

The oil extracted from the seed has medicinal uses.

151. HIBISCUS CANNABINUS LINN.

Family: *Malvaceae*

Local Names: Ambari, mesta pat, patsan, sann.

English Names: Ambari Hemp, Bimlipatan Jute, Deccan Hemp.

Description: An annual or perennial; prickly stem glabrous. Leaves variable, upper deeply palmately-lobed, lower entire, cordate; stalk prickly. Flowers axillary, short-stalked; bracts 7-10; calyx bristly; corolla large spreading, yellow with a crimson centre. Capsules glabrous, pointed, bristly; seeds many, glabrous.

Distribution: Not a native of India; but now very widely grown in Bombay, Madras, the Punjab, Uttar Pradesh (the United Provinces) and Madhya Pradesh (the Central Provinces); apparently wild in some parts.

Uses: The valuable part of the plant is its well-known fibre; it is soft, white, silky; it is equal to jute of superior quality, slightly longer, broader and more thick-walled; it is employed for all purposes for which jute is suitable; it is used for tying rafters, roof-binding, making sacking, hessian and coarse canvas; ropes made out of the plaited fibre are used for drawing water and as hobble ropes; the fibre is also used in paper manufacture, for making fishing nets, and for caulking canoes.

The leaves are used as a vegetable. The seeds are fed to cattle and poultry; the oil from the seeds is useful as a lubricant and for lighting lamps.

The leaves, flowers and seeds have medicinal uses.

152. HIBISCUS TILIACEUS LINN.

Family: *Malvaceae*

Local Names: Belapat, bola, chelwa, nirparutti.

Description: A small much branched tree or shrub; bark smooth grey; young parts pubescent. Leaves almost spherical, entire, crenate, cordate, glabrous above, hoary beneath; blade 3-5 in. diam. Flowers in axillary or terminal few flowered racemes with broad, tomentose bracts at the base of the short, thick stalks; calyx lobes triangular, grey downy outside; corolla bell-shaped, pubescent outside, 3-4 in. across, yellow, turning red in the evening, with a crimson centre. Capsules 5-valved, tomentose; seeds black.

Distribution : Coastal forests, and along tidal rivers near the sea coast all around India and Pakistan.

Uses : The wood, known as " cork wood " in some places, is white-grey, light and durable under salt water; it is used for making light boats, and floats for fishing nets, for cabinet work, and as fuel. The stem is also utilized for making paper pulp of inferior quality.

A fibre is extracted from the inner bark, which is more resistant to water than jute; it is used for making elephant-timber-dragging ropes, sacking, mats, fishing nets, etc.

The tree is useful in mangrove areas as a mud-binder and land-builder.

The bark is used medicinally.

153. HITCHENIA CAULINA BAKER.

Family : *Zingiberaceae*

Local Names : Chawar, nisham.

Description : Root-stock tuberous, bearing only small tubers at the ends of long, slender fibres; stem 3-4 ft. high. Leaves oblanceolate, oblong, 12 in. or more long, 4-5 in. broad, narrowed gradually from the middle to the base. Flower spike 5-6 in. long, bracts crowded, 1-1.5 in. long, upper spreading; flowers white.

Distribution : Mahableshwar and the Konkan.

Uses : A flour is obtained from the tubers; after two washings the flour is particularly useful for glues and sizing; further washings make it fit for human consumption as arrow-root.

The leaves are very useful in the paper-making industry.

154. HOLIGARNA ARNOTTIANA HOOK. F.

Family : *Anacardiaceae*

Local Names : Bibu, cheru, holiger, hulgeri, sudrabilo.

Description : A large, evergreen tree; bark smooth, ash-coloured. Leaves leathery, long and tapering, blade 6-12 in. long, shining, dark green above, pale beneath. Flowers in compound racemes, crowded at the ends of leafy branches, unisexual; male flowers 0.25 in. across; calyx rusty pubescent; corolla 5-lobed, pubescent outside; female flowers minute, ovary hairy at the apex. Fruit 1 in. long, black, glabrous, stalk elongating after flowering.

Distribution : Indigenous in Western Peninsula from the Konkan southwards, Coorg, Travancore, the Nilgiris.

Uses : The wood is light grey, lustrous, soft and satiny; it is used for house building, boat building, dugouts, light packing cases, cigar boxes, match splints and in Mangalore for breaks on country carts.

The acrid juice from the trunk and the rind of the fruit is used as varnish by painters.

The bark and the fruit have medicinal uses.

155. HOPEA PARVIFLORA BEDD.

Family : *Dipterocarpaceae*

Local Names : Bhogi, bovumara, im, kiral, konju, tirpu.

English Names : Hopea, Iron Wood of Malabar.

Description : A large tree; branchlets reddish-brown, slightly downy. Leaves 3-5 in. long. ovate or oblong, firm, margins slightly undulate, glabrous. Panicles tomentose, stalk minute; flower buds minute, tomentose, very shortly stalked; tips of petals dilated and crisped. Fruit not known.

Distribution : Moist forests of the Western Ghats from South Kanara southwards, in Malabar, Travancore, Tinnevelly, Coorg.

Uses : The wood is brown, hard and durable. As timber it is excellent and is highly prized in Mysore; it is classed as a little inferior to teak (*Tectona grandis*) in quality and utility; it is resistant to white ants; it is particularly used for piles and bridge construction; in Travancore it is in great demand for boat building; it is also used for house building, oars, cart shafts, yokes, well construction, railway sleepers, engine break blocks, furniture and mining timber.

The bark contains 14-28 per cent of tannin.

156. HYMENODICTYON EXCELSUM WALL.

Family: *Rubiaceae*

Local Names: Bhalena, bhaulan, bhorsal, kuthan, phaldu.

Description: A large, deciduous tree; bark thick, soft, grey coloured, exfoliating in irregularly shaped scales; all parts more or less pubescent. Leaves ovate or ovate-elliptic, 4-10 in. long, membranous, pubescent. Flowers numerous, white, fragrant, stalked, in dense, cylindric, leafy bracteate spikes, arranged in terminal panicles; bracts bullate; calyx tomentose, 5-toothed; corolla slender, tomentose outside, 5-lobed. Fruit ovoid, 2-valved, 0.75 in. long, stalk stout, recurved.

Distribution: Dry hills at the base of the Himalayas, Bihar, Madhya Pradesh (the Central Provinces) and Peninsular India.

Uses: The wood is white at first, turning later to brownish-grey, soft; it is used for making toys, scabbards, palanquins, packing cases, barrels, tea chests, drums, sieves, cheap grade furniture, brush ware, agricultural implements, grain measures, match boarding, tubes for jute mills, and similar articles.

The Santals use the leaves for dyeing; they also serve as cattle fodder.

The bark is astringent and is used in tanning. It yields an alkaloid which is used as a substitute for quinine in indigenous medicine.

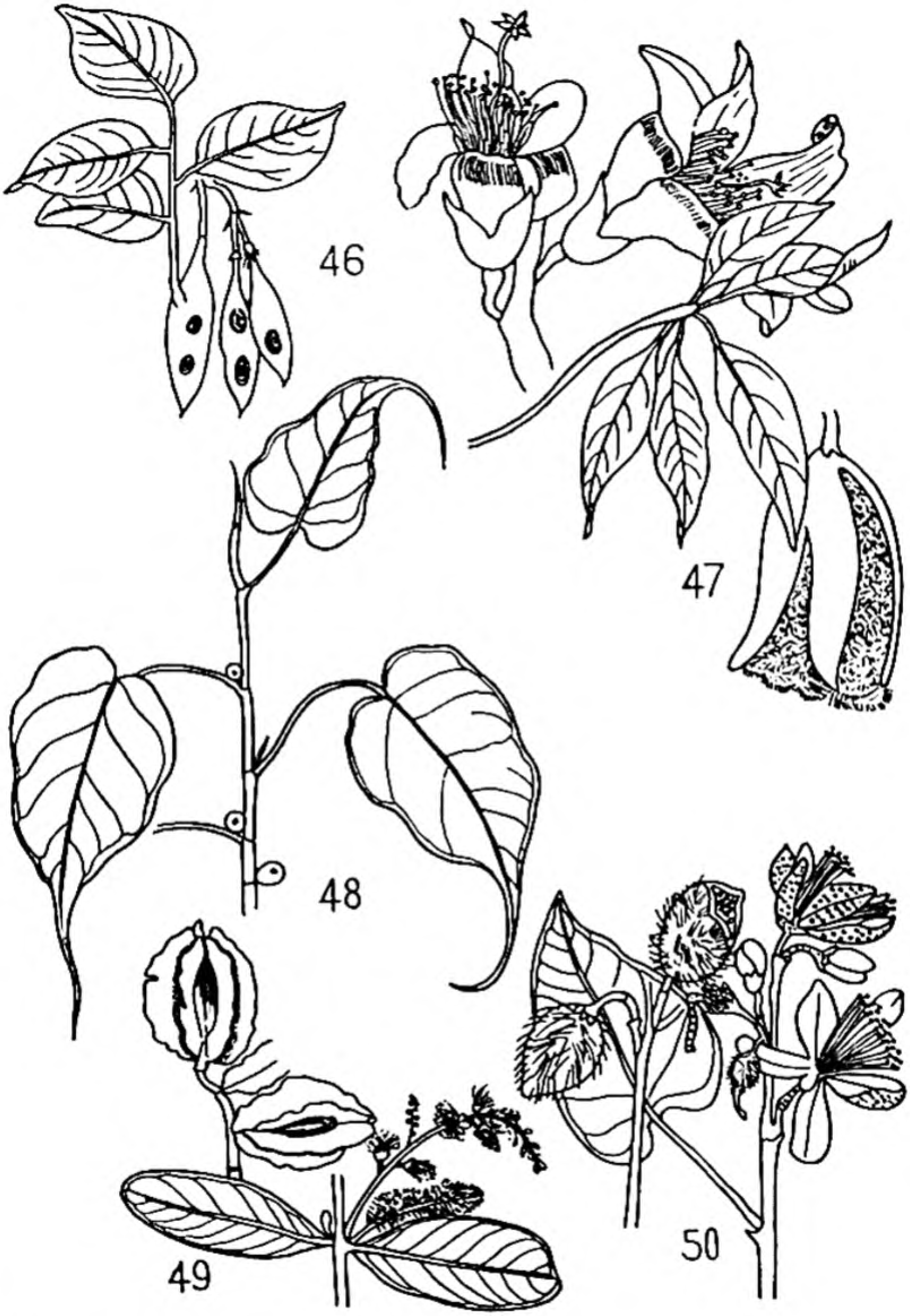
157. IMPERATA CYLINDRICA (LINN.) P. BEAUV.

Syn. I. arundinaceae Cyr.

Family: *Gramineae*

Local Names: Dabh, dirhu, sir, usirh.

Description: A variable, perennial grass, arising from a deep-seated rhizome, easily recognised by its white fruiting panicles. Stem erect, slender, up to 8 ft. high, 3-4-noded, glabrous, solid. Leaves glabrous, or densely bearded with white hairs; leaf-sheath loose, glabrous. Inflorescence silvery white, very dense, narrow, plume-like panicle of many branches and spikelets, easily recog-


46
47
48
49
50

46, Dalbergia sissoo. **47**, Salmalia malabarica.
48, Ficus religiosa. **49**, Terminalia Arjuna. **50**, Bixa orellana.

nised when the purple stigmas are emerging from the sides of the spikelets. Fruiting panicle silvery white with wide, spreading callus hairs.

Distribution : Sind, the Punjab, Bombay State, Uttar Pradesh (the United Provinces), Bengal, ascending the Himalayas up to 7,000 ft.; widely dispersed over Northern India both on the hills and the plains.

Uses : The stem yields a fibre, which is used, like " munja " (*Saccharum munja*), for preparing the sacrificial thread of Hindus. The stem is used for thatching, and as a raw material for paper making.

An alcoholic beverage, like beer, is prepared from the runners; sugar can also be made from this grass, but not on a commercial scale.

The seeds are used as a styptic.

158. INDIGOFERA TINCTORIA LINN.

Family : *Leguminosae*

Local Names : Guli, nil, nilam, nili-mandu.

English Name : Indigo.

Description : An annual, herbaceous shrub, up to 6 ft. high; branches thin, silvery. Leaves 1-2 in. long, leaflets 9-13, opposite, membranous, obovate-oblong, turning blackish when dried, stalk 0.5-1 in. long. Racemes nearly straight, 0.75-1 in. long; flowers small, reddish-yellow; stalks finely recurved; calyx pubescent. Pods nearly straight, 0.75-1 in. long, somewhat knotty, 8-12 seeded.

Distribution : Wild in Central India, but cultivated all over India, especially in Bihar, Uttar Pradesh (the United Provinces) and Madras.

Uses : This is the only plant that yields a blue dye. As a vegetable blue dye it is unrivalled because of its great natural fastness, both to light and water; the colour is contained only in the leaves; it is used for dyeing and painting.

The seeds contain an oil. Leaves, seeds and roots are of medicinal value.

159. JATROPHA CURCAS LINN.

Family: *Euphorbiaceae*

Local Names: Bagh bherenda, jamalgota, jungli arandi, safed arandi, safed ind.

English Name: Physic nut.

Description: A soft wooded shrub, or small evergreen tree; bark smooth, greenish; young shoots often pubescent. Leaves long-stalked, angular, globose or cordate, 4-6 in. long. Flowers unisexual, in stalked cymes, greenish-yellow; male and female flowers on the same plant; sepals and petals 5 each. Capsules 1-1.5 in. long, ovoid.

Distribution: Indigenous in America; grown as a hedge plant or cultivated in most parts of tropical India and Pakistan.

Uses: The plant is of commercial importance because of the albuminous seeds being rich in oil which has many uses. The oil, known as " jatropha oil," contains croton resin and is used by the Javanese as a stimulant for the growth of the hair; the oil burns without smoke and so is useful as an illuminant; its chief use is in the manufacture of hard soap and candles; it is also employed as a lubricant, but cannot replace castor oil as it is semi-drying; in England and other countries the oil is used for wool-spinning and for manufacturing Turkey red; the Chinese make a varnish from the oil in conjunction with iron oxide.

Three kinds of poisons are obtained from the seed; the shell of the seed contains one poison; the albuminoid " curcin," of the group of ricin and crotin, is present in the albumen of the seed; a poultice of the seeds or their oil contains a third poison which acts as an irritant on the skin.

A black or dark blue dye is extracted from the bark and juice of the plant; it dyes linen black. The juice can be also used as a styptic.

The twigs are used as chew-sticks or tooth brushes.

All parts of the plant have medicinal uses.

160. JUGULANS REGIA LINN.

Family: *Juglandaceae*

Local Names: Akhor, akhrot, charmaghz, dun, krot, thanka.

English Name: Walnut Tree.

Description : A large, deciduous, aromatic tree; young parts tomentose. Leaves alternate, 6-12 in. long; leaflets 5-13, opposite, ovate-oblong, 3-8 in. long, usually entire. Flowers green, unisexual, male and female flowers being on the same tree; male catkins on the previous year's wood, often 2 super-posed, pendulous, 2-5 in. long, perianth lobes 5-6; female flowers without stalks, terminal, solitary or 2-3, perianth minute. Fruit ovoid, 2 in. long, green; rind thick leathery, aromatic, enclosing irregularly furrowed, thick-shelled, 2-valved nut.

Distribution : Indigenous in Trans-Indus, Baluchistan, Kurum Valley, North-Western Himalayas, Sikkim and Nepal.

Uses : The wood is greyish-brown, beautifully mottled, moderately hard; it is highly valued for furniture, cabinet work, carving, veneering, musical instruments like drums and " sitars," inside of cabins of boats, lacquer work, drawing instruments, Indian pipes and hookas, gun-stocks, and middle-pieces of tennis, squash and badminton rackets; it is also used for hand-looms, shafts, ploughs, aeroplane propellers, etc.; the " burrs " formed on the trunk of the tree are particularly valuable.

The fruit is another valuable product of the tree. The shell or outer covering of the green walnut yields a dye, which is used for staining wood; when applied to the skin the juice gives it a rich, dark brown shade; it is however not used for colouring the hair. The shell is also used for tanning; that of the unripe fruit serves as a fish poison. The meat of the nut is an important article of diet in Kashmir and North-West Himalayas; the nut is also very much prized as a dessert and is used in confectionery. The meat is rich in oil which is much used for culinary purposes and as a luminant; it has an iodine value of about 150; on account of its siccative value the oil is used by artists.

The bark is used as a dye and as a tooth stick. Women colour their lips red by chewing the bark.

The twigs and leaves are valued as fodder.

The bark is sold in the bazaar as " dindasa " and " musag " and has medicinal properties; the leaves and fruits also are used medicinally.

161. JUNIPERUS MACROPODA BOISS.

Family: *Coniferae*

Local Names: Appurz, dhup, ghushki, shur.

English Names: Indian Juniper, Himalayan Pencil Cedar.

Description: A small or middle-sized tree, rarely attaining 50 ft.; trunk short, but of great girth; bark exfoliating in long, fibrous strips; foliage light and open. Leaves of two types, (1) scale-like, usually opposite, rhomboid, convex, with a large, resinous gland at the back; (2) awl-shaped, opposite or in whorls of 3, pungent. Male catkins at the end of branchlets, about 0.5 in. long. Berries nearly globose, bluish-black when ripe, very resinous, 2-5-seeded.

Distribution: Baluchistan 7,000-10,000 ft., Kurum Valley at 9,000 ft., Chitral above 8,000 ft., inner Himalayas from Nepal westwards at 5,000-14,000 ft.

Uses: The wood is red or purplish, moderately hard, fragrant, durable, and resists the action of moisture; it is used for building purposes, furniture, water-channels, vessels for water and milk, walking sticks, and commonly as fuel; of all the Indian and Pakistan woods it is the most valuable wood for first class lead pencils. Cedar oil is manufactured by distilling shavings and saw-dust; the shavings, after the extraction of cedar oil, are converted into linoleum. The wood, twigs and fruit are burnt as incense.

162. KYDIA CALYCINA ROXB.

Family: *Malvaceae*

Local Names: Baranga, pola, potari, puli patha, warung.

Description: A small deciduous tree. Leaves lobed, angled or rounded, cordate, tomentose above, grey-felted beneath, blade 4-5 in. long, mid-rib with a raised gland. Flowers 0.5 in. across, in much branched panicles. Petals white or purplish, downy on the margins and hairy at the base of the claw; bracts downy, forming a persistent ring round the globose, 3-valved, small capsule.

Distribution: Tropical Himalayas from Kumaon eastward; common on the Western Ghats and the Satpuras, and in Mysore; chiefly in deciduous forests.

Uses: The wood is brownish- or purplish-grey and light; it is used for match sticks, inside boxes of matches and for peeling purposes; small articles for domestic use are made of the wood; in Madras it is used for carving; it has been found suitable for medium quality brush backs.

A good, strong, white fibre, peeling off in thin, ribbon-like bands, is obtained from the plant; the fibre is utilized for cordage and rope-making; the fibre is used for tying up timber rafts for floating and for making elephant drag ropes.

The bark is mucilagenous and is used for clarifying sugar in some of the northern parts of India.

163. LAGERSTROEMIA LANCEOLATA WALL.

Family: *Lythraceae*

Local Names: Bili-nandi, nana, nandi, venda, venteak.

English Names: Benteak, Nana Wood.

Description: A large, deciduous tree; bark white, smooth, peeling off in large papery strips. Leaves sometimes alternate, elliptic-lanceolate or broadly ovate, leathery, glabrous, shining above, usually white or greyish-blue, hoary tomentose beneath, blade 2-4 in. long. Flowers in large, branched, leafy panicles; buds usually pubescent; calyx-tube hoary tomentose, lobes tinged with pink, persistent in fruit; petals strap shaped, with a long, slender claw. Capsules about 0.5 in. long, ellipsoid.

Distribution: Confined to limited areas; the western coast of India from Bombay to Travancore, extending to Mysore, Coorg, the Nilgiris, parts of Madras, in deciduous forests, up to 4,000 ft.

Uses: In spite of its limited distribution, "venteak" is very valuable as it yields one of the best timbers, especially of the west coast. The wood is red or reddish-brown, moderately hard, very elastic, tough and durable, especially in salt water; in South India it is highly valued by shipwrights; it is also much used for constructional work, bridges, carts, furniture, coffee boxes, oil casks, turnery, mast poles, grinding mills, agricuutural implements, spokes and felloes of wheels, shafts, frames of carriages, general carpentry purposes, etc.

The bark is useful as a tanning material.

164. LAGERSTROEMIA PARVIFLORA ROXB.

Family: *Lythraceae*

Local Names: Asid, bakli, dhaura, kat, lendya, seja.

Description: A moderate-sized, deciduous tree; bark light brown, peeling off in thin, long scales; young parts usually glabrous. Leaves opposite, leathery, green, glabrous above, 2-4 in. long, stalk if present very small. Flowers white, fragrant, 0.75 in. across, in panicles; calyx not ribbed, glabrous or downy, lobes 6, ultimately woody, closely surrounding the fruit; petals white, broadly ovate, undulate on the margins. Capsules ovoid or obovoid, up to 1 in. long.

Distribution: In dry deciduous forests in the Sub-Himalayan tract from the Jumna eastwards up to 3,500 ft. high, Assam, lower Bengal, Utkal (Orissa), Central India and northern Bombay.

Uses: The wood is hard, grey or greyish brown to reddish, elastic, and compact; it is extensively used for house building, carts, furniture, boats, oars, dugouts, canoes, tool handles, coopers' work, wood pipes, water tanks and fuel; golf shafts made from this wood have been found to be satisfactory.

The bark contains 7-10 per cent of tannin; it is used for tanning and dyeing leather; light weight leather is coloured a good light fawn; it is also used for dyeing thread. The fibre extracted from the bark is poor in quality and is used for making coarse ropes. The gum that exudes from the bark is sweet and edible.

The leaves also contain tannin, about 16 per cent, and are used for tanning skin by local villagers.

Tussore silk-worms are fed on this tree.

165. LAGERSTROEMIA SPECIOSA (L.) PERS.

Syn. **L. flos-reginae** Retz.

Family: *Lythraceae*

Local Names: Ajhar, arjuna, jarul, taman.

English Names: Pride of India, Queen Flower.

Description: A large, deciduous tree; bark smooth, greyish or cream-coloured, peeling off in broad, irregular flakes. Leaves glabrous, opposite or sub-opposite, slightly leathery, elliptic or lanceolate, 6-8 in. long, dark green above, pale beneath. Flowers purple-lilac, 2-3 in. across, in terminal panicles; calyx tomentose, 12-ribbed, lobes 6, thickened at the margins; petals 6, clawed, margins spreading, undulate and crumpled. Capsules broadly ovoid, 5-6-valved, woody, seated on the woody, thickened, ribbed calyx.

Distribution : Throughout India and Pakistan; common in the forests of Assam, Bengal and the West Coast.

Uses : Taman or jarul is one of our important timber trees and one of the principal timbers of Assam, Sylhet, Cachar and Bengal. The wood is light red to reddish-brown, shining, hard, very durable under water, and takes a good polish; it is used for a variety of purposes; it is an excellent wood for ship building, boats, canoes, gun carriages, and carts. It is also used for railway sleepers in Assam and Bengal, beams, bridges, constructional work, furniture, coopers' work, planking, paddles, oars, heavy checks, mortars, rice pounders, felloes, cart naves, water tanks, wood pipes, etc.; it is often used as a substitute for walnut.

The leaves and the fruit contain 12-17 per cent of tannin; they are used for tanning.

The various parts of the tree have medicinal uses; the roots, stems and leaves contain hydrocyanic acid.

166. LANNEA GRANDIS (DENNST.) ENGL.

Syn. **Odina wodier** Roxb.

Family : *Anacardiaceae*

Local Names : Jingan, jiyal, kashmal, wodier, wuda.

English Name : Wodier Wood.

Description : A moderate-sized, deciduous tree; bark ash-coloured, thick, scaly; twigs thick, starchy. Leaves tomentose when young, glabrous when mature, odd-pinnate, 12-18 in. long; leaflets 7-9, opposite, entire, 3-6 in. long, shining. Flowers very small, unisexual or bisexual, in compact clusters, yellowish or greenish; racemes numerous at ends of branches; female racemes unbranched, pubescent; male racemes branched, clustered; calyx

4-lobed, persistent; petals 4, pink and greenish-yellow. Drupes ovoid, oblique, compressed, glabrous, red when ripe, outer covering fibrous; seeds large, oily.

Distribution : Dry deciduous forests of most parts of India, chiefly in Lower Himalayas, up to 4,000 ft., and in the Sub-Himalayan forests as far as Assam, throughout Central and Southern India.

Uses : The wood is reddish-brown, moderately hard, resistant to white ants; the timber is marketed under the trade name of " wodier wood "; it is used for spear-shafts, scabbards, wheel spokes, yokes, rice pounders, common furniture, boot-lasts, cutting blocks, carving, packing cases, plough shafts, water pipes, water troughs, canoes, dugouts, ribs and helms of boats, house building, utensils, carts, oil presses, clod crushers, well construction, water lifts, cabinet work, turning, combs, coopers' work, mining timber, drums, tom-toms, coffins, brush backs and handles, etc.; the wood is particularly suitable for delicate carving; it is also very suitable for match sticks, but not for match boxes; it makes wood pulp but of inferior quality.

A mucilagenous gum exudes from the trunk; it is clear, brown and brittle; it is known as " jingan gum " or " jingan-ki-gond "; it is non-astringent and composed of arabic-galactan; it is usually used in combination with " dhaura " (*Anogeissus latifolia*) gum in calico-printing and for sizing cloth by village weavers. In Nepal, the gum is used in paper sizing; in Kumaon and Madras it is mixed with lime for white-washing and plastering; it serves as the basis of an inferior varnish and as a preservative for fishing nets; in Bengal, Brahmins use the gum to stiffen their Brahminical thread; it is also used as a mucilage, for making inks, and in the finer parts of stucco work; it is extensively used in confectionery.

Young branches and leaves make good fodder for cattle and elephants.

The bark contains 10-12 per cent of tannin; it is used for tanning; the dye extracted from it colours tussore silk brown or golden. The bark is often employed as a substitute for hides to protect an elephant's back from the weight of dragging chains; a tough, coarse fibre suitable for cordage is extracted from the bark. In some places the powdered bark is used as a tooth powder. It has also medicinal uses.

167. LAWSONIA INERMIS LINN.

Syn. L. alba Lam.

Family: *Lythraceae*

Local Names: Henna, medi, mhendi.

English Names: Henna Plant, Mignonette Tree.

Description: A large, glabrous, deciduous shrub or small, straggling tree; bark rusty-brown, fairly smooth; branchlets quadrangular, often spinescent. Leaves opposite, elliptic, about 1.75 in. long, glabrous. Flowers small, in dense terminal panicles, fragrant, white or rose coloured; sepals 4; petals 4, roundish, margins undulate. Capsules green and shining when young, later turning red; ultimately dry with a brittle outer wall and tipped with the persistent style, depressed, globose; seeds numerous.

Distribution: Wild in Baluchistan and on the Coromandel Coast; throughout India and Pakistan.

Uses: The wood is of minor utility; it is converted into tool handles, tent pegs and other small articles.

The plant is very widely known from ancient times because of the most important cosmetic dye obtained from its leaves. The dye, henna, was well known even to the ancient Egyptians; finger-nails of Egyptian mummies have been found to be dyed with henna. In India and Pakistan henna is very widely used, both by men and women, for colouring fingers, nails, hands, and hair; the hair is dyed a brownish-chestnut shade, which turns black in conjunction with indigo; to dye the hair an infusion of dried leaves to which is added a little lime juice is used. Henna leaves dye fingers, nails, hands and feet a dull orange. A deep red colour is obtained when henna is mixed with catechu. An infusion of the leaves is also used for dyeing cotton fabric a light reddish-brown; the shade is known as " malagiri "; wool and silk are dyed reddish- or yellowish-brown. Cossacks give a protecting colouring to their sheep-skin caps by dyeing them with henna. The colouring properties of the leaves is due to the presence of " lawsone " which can be extracted as orange-yellow crystals; it is readily fixed on wool and silk.

The leaves are not only used as a dyeing agent but are also useful in the manufacture of ottos and perfumed oils, and at times as a tanning agent.

On distillation the flowers yield an aromatic essential oil, used in perfumery and embalming. An oil is also extracted from the seeds.

Leaves, bark, flowers, and seeds have medicinal uses.

168. MADHUCA BUTYRACEAE MACBRIDE

Syn. Bassia butyraceae Roxb.

Family: *Sapotaceae*

Local Names: Chiura, phalwara, phulel, phulwa.

English Name: Indian Butter Tree.

Description: A large deciduous tree; branchlets, leaf-stalks and underside of leaves clothed with fine silky hairs. Leaves clustered near the ends of branches, leathery, obovote or obovate-oblong, blade **6-12** in. long. Calyx segments **5**; corolla not fleshy, lobes **8-10**, spreading. Fruit fleshy, **1** in. long.

Distribution: A native of Kumaon, Bhutan and Sub-Himalayan tracts from the Ganges to Bhutan up to **15,000** ft. altitude.

Uses: The seeds yield a vegetable butter, known as "phulwa"; it is used as a luminant, cold cream, and lip salve. The fruit pulp and the oil cake are edible. The seeds contain a saccharine matter; sugar is manufactured from it in Kumaon. The flowers are not edible but sugar is manufactured from them.

The vegetable butter is also used as a lubricant in rheumatism.

169. MADHUCA INDICA J. F. GMEL.

Syn. Bassia latifolia Roxb.; Madhuca latifolia (Roxb.) Macbride

Family: *Sapotaceae*

Local Names: Mahua, mowra.

English Names: Butter Tree, Mohwa Tree.

Description: A large, deciduous tree with a short but straight trunk, and rounded crown; bark thick, dark coloured, fissured, scaly; young parts tawny tomentose. Leaves clustered near the ends of branches, elliptic or oblong-elliptic, 6-10 in. long, rigid, leathery. Flowers in dense clusters at or near the ends of branches; stalks 1-2 in. long; buds 0.75 in. long, ovoid, densely rufous-tomentose; calyx and corolla segments 4 or 5; calyx leathery; corolla cream coloured, fleshy, sweet. Fruit ovoid, green, fleshy, 1-2 in. long, 1-4-seeded.

Distribution : Indigenous in the Sub-Himalayan tract, in deciduous forests of Madhya Bharat (Central India), Madhya Pradesh (the Central Provinces), Western Ghats and Kumaon Terai.

Uses : The wood is dark red or reddish-brown, hard to very hard, durable and takes a good polish; it is very suitable for building purposes, bridge piles, ships, boats, dugouts, canoes, well construction, oil and sugar mills, furniture, drums, tom-toms, yokes, axles, carving and turning. But the tree is not felled for its timber as commercially its flowers and fruits are more valuable. The fleshy corolla contains much sugar, and so is nutritious and pleasant to the taste; wherever the tree grows the fallen flowers are avidly collected; they form an important article of diet; they are also extensively used for distilling spirit. The fruit is of considerable commercial importance; the outer part is eaten raw or cooked; the inner part is made into flour for cakes, etc. The most valuable part of the fruit is the seed because of its oil contents. The oil is the mohwa butter of commerce; it is edible. It is used in cooking, for adulterating ghee, and for burning in lamps. The dried seeds are employed in the manufacture of margarine and soap. The oil cake makes a valuable fertilizer and is applied to lawns to kill worms; it is also used to poison fish, and as a cheap substitute for " shikekai " (*Acacia concinna* pods) for washing the hair. The smoke from the burning oil cake is said to kill insects. The seeds contain a neutral saponin, and the leaves a glucoside saponin and traces of an alkaloid.

The gum exuding from the tree is considered to be a natural substitute for gutta-percha. The bark is used as a dye.

The flowers, the spirit distilled from them, and the oil from the seeds have medicinal properties.

170. MADHUCA LONGIFOLIA (L.) MACBRIDE.

Syn. Bassia longifolia Linn.

Family: *Sapotaceae*

Local Names: Mahua, moha, mowa.

English Names: Indian Butter Tree, Wild Sapota Tree.

Description: A large or medium-sized, evergreen tree; young parts rusty-tomentose. Leaves papery, linear-lanceolate, glabrous when full grown, blade 4-7 in. long; leaf-stalk 0.5-0.75 in. long. Flowers in dense clusters at the end of branches; flower-stalks drooping, glabrous, slender, 1.5-2.5 in. long; calyx-lobes 4, rusty-pubescent; corolla pale yellow, fleshy, tube inflated, lobes 8-12. Fruit obliquely ovoid, 2 in. long, tomentose when young, glabrous, yellow when ripe, 1-2-seeded; seeds curved, yellow, shining.

Distribution: Western Ghats, dry forests of South Kanara, Malabar and Travancore.

Uses: The wood is dark red or reddish-brown, moderately hard and durable. It is used for bridge construction, house building, ship's keel and planking below the water line, carts, agricultural implements, furniture, etc.

The fleshy flowers and the skin of the fruit are edible; a spirit is distilled from the flowers.

The oil extracted from the seeds is the " phulwa " oil of commerce; it is superior to " mohwa butter "; and is used as a luminant, for soap making and as a substitute for ghee. The oil-cake contains a sapo-glucoside, " mowrin ", and is used as a fertilizer, as a detergent for washing hair, and as a worm-killer on grass lawns.

The bark is used for tanning; it contains 27 per cent of tannin.

The leaves, the green fruits and the oil from the seeds have medicinal uses.

171. MALLOTUS PHILIPPINENSIS (LAM.) MUELL.-ARG.

Family: *Euphorbiaceae*

Local Names: Kamal, kamela, kamud, manjana, raini, shendri.

English Names: Indian Kamila, Monkey Face Tree.

Description: A large shrub or small tree; trunk buttressed; bark thin, grey, irregularly cracked; young parts rusty pubescent. Leaves alternate, variable, usually ovate-lanceolate, 3-7 in. long, glabrous above, underside pubescent with numerous, minute, crimson glands. Flowers unisexual, male and female on separate individuals; spikes terminal, single or in clusters, brown or brick-red, male flowers stalked, yellow, usually 3 together, in slender, drooping 3-6 in. long racemes; sepals 3-4, stamens numerous; female flowers without stalks, solitary in stiff erect spikes, 2-3 in. long, sepals usually 2, ovary glandular, tomentose, scarlet. Capsules 3-lobed, 3-valved, densely covered with an easily detachable, bright red powder, consisting of resin mixed with minute hairs.

Distribution: One of the most widely distributed species in tropical India and Pakistan; Sub-Himalayan tract from the Indus eastwards ascending to 4,500 ft., Bengal and Central and Peninsular India.

Uses: The wood is rather variable in colour, grey to light red, and smooth; it is used for rafters, handles of hoes and axes and similar other purposes; it has been found to be particularly good for match boxes and suitable for peeling purposes, but not for match sticks; it is extensively used as fuel.

The bark contains 6-10 per cent of tannin and is used for tanning leather. Stems, leaves and roots contain hydrocyanic acid. In the Philippines the branches are used to decoy prawns.

The tree is best known for its valuable fruit dye; it is obtained from the mass of glands which clothe the ripe fruit; this mass, which is easily collected from the fruit, is the well known "kamela" powder of commerce; all over this sub-continent kamela is particularly used for dyeing silk a fine yellow or flame colour; to get different tones from pale yellow to dark red kamela is mixed with other ingredients; by women in Madhya Pradesh (the Central Provinces) the powder is used as "shendur"; men decorate their faces with this dye.

"Kamela" powder is not only a valuable dye but it is also a vermifuge, especially for tape worm.

The flowers also contain a dye, which with lime water and alum gives cotton fabrics an orange colour.

The tree has many medicinal uses.

172. MANGIFERA INDICA LINN.

Family: *Anacardiaceae*

Local Names: Am, amba, ambi.

English Name: Mango Tree.

Description: A large, evergreen tree, glabrous except the inflorescence; bark thick, rough, brown or blackish. Leaves alternate, leathery, oblong-lanceolate or oblong, entire, margins often undulate, 5-12 in. long, dark green. Flowers unisexual and bisexual, very small, in large terminal, erect, pubescent panicles. Fruit 2-8 in. long, smooth, variable in shape.

Distribution: Indigenous in Sikkim, parts of Assam, Khasi Hills, the Satpura Range and the Western Ghats; cultivated throughout India and Pakistan.

Uses: The wood is dull grey with darker patches or streaks, lasts well under water; it is very suitable for piles, completely immersed in water; it is used for planking, door and window frames, tea chests, packing cases, cheap furniture, dugout canoes, Masula boats, oars, well construction, sieve-frames, brush backs, ploughs, yokes, solid cart wheels, hood frame for tongas, felloes of wheels, coopers' work, plywood, and in Mysore for building purposes. This wood is found very suitable for making heels which are superior to the imported article made of beech.

The bark being resinous is used for tanning only occasionally, even though it contains 17 per cent of tannin. The bark also contains a yellow dye. Powdered bark constitutes one of the ingredients of "kabis," which is used for painting pottery before it is fired to give the pottery a black colour. Matting and cloth dyed blue with indigo change to green with the use of mango bark. Cotton, wool and silk can be dyed with the bark.

The leaves contain a dye in the form of a yellow crystalline substance; it is euxanthic acid. In the past this dye, known in Bihar as "piury" or "peori" and in Calcutta as "perirang," was extracted through the agency of cows; these animals were fed only on mango leaves, and their urine was collected in earthen pots; from this urine "peori" was ultimately obtained; it is of a yellow ochre colour and used for painting woodwork, but not for dyeing cloth as it imparts a characteristic unpleasant smell to the fabric. As feeding the animals wholly on mango leaves shortens their lives the practice of extracting the dye from their urine is now discontinued.

"Am" attar is distilled from the flowers. The best known part of the amba tree is of course its fruit, which is highly prized wherever it is available, not only as a delicacy but also as food; both the flesh and the seed are widely consumed; the fruit is eaten raw or made into pickles and conserves. The dry, unripe fruit is used as a mordant, especially in dyeing with safflowers; the flesh dyes yellowish drab or grey shades.

The Siamese eat the mango flowers; the Javanese eat the very tender, purple leaves.

The various parts of the tree have medicinal uses.

173. MARSDENIA TENACISSIMA WIGHT. & ARN.

Family: *Asclepiadaceae*

Local Names · Jiti, tongus.

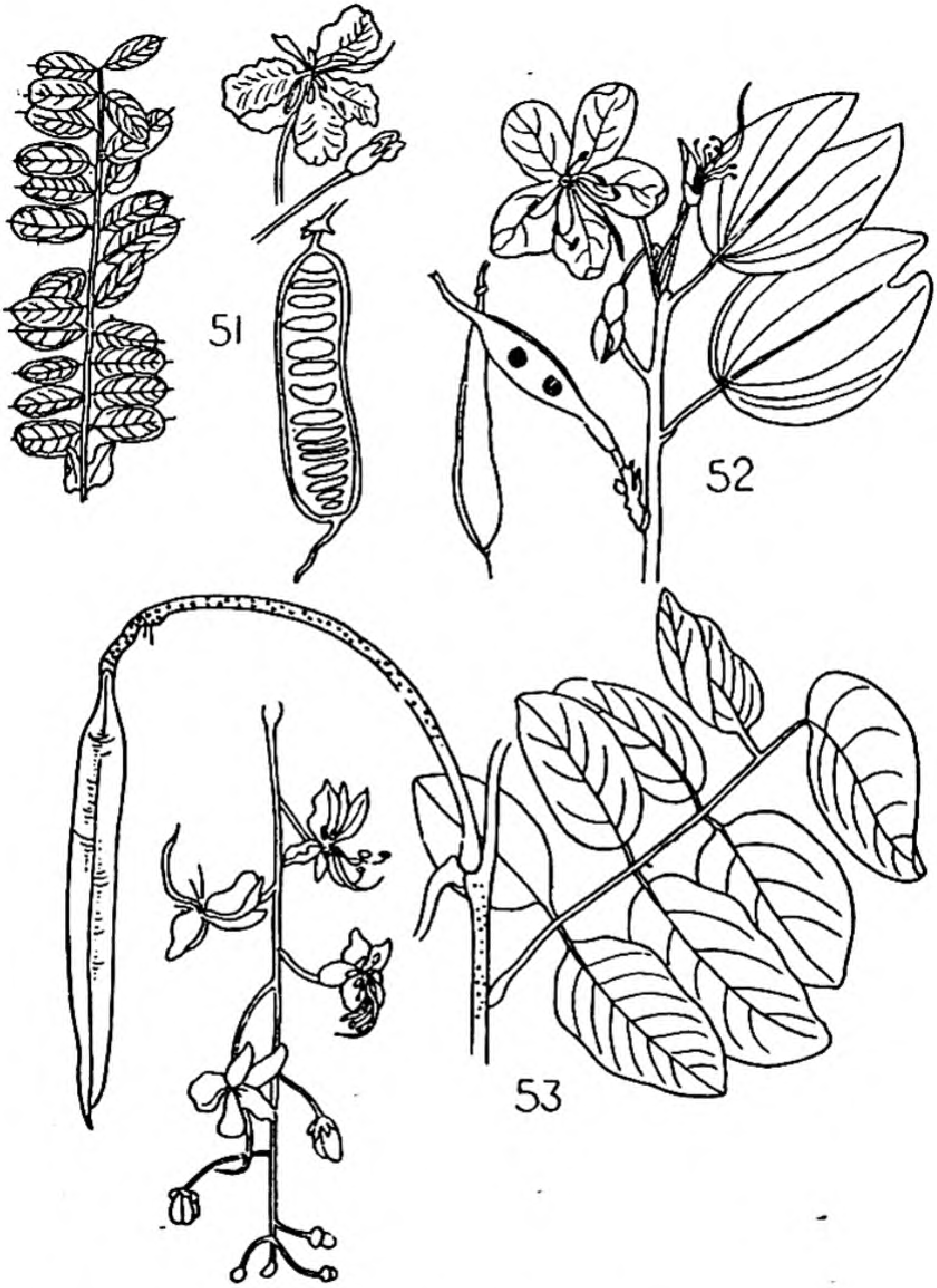
English Name : Rajmahal Hemp.

Description : A climbing shrub; stem very short; branches, leaf-stalks, underside of leaves and inflorescence velvety or tomentose. Leaves broadly ovate, base 2-lobed, upper surface also may be velvety, stalk long. Cymes much branched; corolla 0.25 in. across, corolla lobes pubescent without, glabrous within, corona scales leathery. Follicles 5-6 in. long, lanceolate, outer covering thick, longitudinally wrinkled, finely pubescent.

Distribution : Sub-Himalayan tracts, Chittagong, lower hills of Bengal and Kumaon.

Uses : The plant is best known for its excellent fibre, which is ranked as the second best fibre of India and Pakistan. The fibre is extracted from the bark; it is exceptionally strong, fine, silky and elastic; it is therefore very much in demand for bow-strings, netting, and cordage.

On drying the milky juice becomes elastic; it is used for removing black lead marks.



51, Cassia auriculata. **52,** Bauhinia purpurea.
53, Cassia fistula.

174. MELALEUCA LEUCADENDRON LINN.

Family: *Myrtaceae*

Local Names: Cajupata, ilachie, kayaputi.

English Names: Cajeput Oil Tree, Punk Tree, Swamp Tea Tree.

Description: A middle-sized, evergreen tree; bark white, thick, spongy, peeling off in papery flakes. Leaves alternate, elliptic or narrow lanceolate, leathery, 2-3 in. long. Flowers whitish, without stalks, in axillary spikes, 2-6 in. long, the stalk of the inflorescence often prolonged and leaf-bearing.

Distribution: A native of Burma and Malaya; but widely grown in India.

Uses: The wood is reddish-brown or violet-brown, hard and durable; it resists the action of salt water and so is used for piles, ship building and floats for fishing nets; it is also useful as firewood and for making paper pulp. The wood pulp mixed with dammar is used for caulking boats, sealing distilling equipment, and for making torches.

The bark is papery, durable, and almost water-proof; it is used as a material for writing upon; some of the sacred writings have been inscribed on it; it serves as a good material for packing fruit parcels and making torches.

The leaves are aromatic and contain an essential oil, which is extracted by distillation; it is the "cajeput oil" of commerce; it contains 50-60 per cent of cineol, and is useful as a pharmaceutical oil for headache, earache, etc.; it is also a strong insect repellent; it is less volatile than citronella oil, and therefore preferred as a mosquito repellent. An infusion of the leaves is used as a substitute for tea.

175. MELIA AZEDARACH LINN.

Family: *Meliaceae*

Local Names: Bakain, bakayan, drek, mahanimb, wilayati nim.

English Names: Bead Tree, China Tree, Persian Lilac.

Description: A moderate-sized, deciduous tree; bark greyish-brown, vertically fissured; young parts downy. Leaves pinnate twice or thrice, 9-18 in. long; pinnae opposite or nearly so, with 3-5-7 leaflets; leaflets opposite, ovate-lanceolate, serrate or entire, up to 3 in. long. Flowers bisexual, lilac or purple and white in colour, fragrant, in axillary panicles; sepals and petals 5 or 6 each; staminal-tube purple. Drupe sub-globose, about 0.75 in. long, yellow and wrinkled when ripe; stone hard, 5-seeded.

Distribution : Indigenous in Baluchistan, Jhelum Valley and Kashmir; wild in the Sub-Himalayan tract; found throughout India and Pakistan.

Uses : The wood is red, soft, handsome and takes a good polish; it is used for house building, boat building, furniture, ploughs, yokes, cigar boxes, etc.

An oil is extracted from the fruit which is similar to that obtained from nim (*Azadirachta indica*) fruit. The oil mixed with powdered and boiled seeds of *Rhus succedanea* makes a wax, known as Japan Wax, which is made into candles. The fruit is used in the manufacture of an insecticide and a flea powder. An alcohol may be prepared from the fruit. Though the fruit is eaten by sheep, goats, and birds it is poisonous to man. The seeds are used for making rosaries and beads, and as charms against diseases. From the tree an alkaloid, " la paraisine," is extracted. The leaves are used as an insect repellent; an infusion of the leaves has been found to be effective for protecting the sprayed plants against attack by locusts. Various parts of the plant are used in pharmaceutical preparations. The medicinal properties of the plant are made use of not only in India and Pakistan but also in Arabia and Iran.

176. MELIA DUBIA CAV.

Syn. M. composita Dalz. & Gibbs.

Family : *Meliaceae*

Local Names : Bevu, karibevan, nimbarra.

English Name : Malabar Nim-wood Tree.

Description : A large, deciduous tree; bark dark brown, thin, rough, scaly; young parts and inflorescence clothed with grey, mealy pubescence. Leaves usually pinnate twice, 9-24 in. long; pinnae 3-7-foliate; leaflets 2-11, opposite, ovate or oblong-lanceolate, toothed. Flowers greenish-white, aromatic, 0.25 in. across, in dense panicles; petals pubescent. Fruit ovoid, size of a large olive; seeds smooth, black.

Distribution : Sikkim Himalayas up to 6,000 ft., Khasi Hills, East and West Peninsula.

Uses : The wood is at first light pink to light red, ageing to pale russet brown, soft, light, lustrous and not readily attacked by white ants; it is used for building purposes, tea chests, outriggers of country craft, cigar boxes, packing cases, etc. In North Kanara the timber is employed for making musical instruments.

The fruit is used medicinally.

177. MEMECYLON EDULE ROXB.

Family: *Melastomataceae*

Local Names : Ali-aku, anjan, anguni, karpa.

English Name : Iron-wood Tree.

Description : A small, handsome tree. Leaves ovate, 1.5-3.5 in. long, leathery, dark green, shining above, paler light green beneath. Flowers stalked, in short, many flowered, compact cymes, forming reddish-blue masses of inflorescence; stalk slender or stout, flattened and grooved, single or clustered; petals blue; stamens with blue filaments. Fruit globose, size of a large pea, black, succulent, crowned with the quadrangular calyx-limb, 1-2-seeded.

Distribution : Common on the coasts of Peninsular India, Utkal (Orissa), Assam, Sylhet.

Uses : The wood is light-brown and very hard; it is used for house posts, building purposes, and combs; it makes excellent firewood and charcoal.

The most useful parts of the plant are the leaves and flowers, because of the dye they contain. A delicate yellow lake colour is obtained when the leaves are boiled in water; the leaves are employed to dye mats and cotton fabrics a deep red colour with myrobalan nuts and sappan wood (*Caesalpinia sappan*) as adjuncts. The flowers yield a fleeting yellow colour; but are generally preferred to alum for bringing out the colour of chaya root (*Oldenlandia umbellatta*).

The pulp of the fruit is edible.

The leaves have medicinal uses.

178. MESUA FERREA LINN.

Family: *Guttiferae*

Local Names: Nag champa, naghas, nagkesar, nahor, thorla champa.

English Name: Iron-wood Tree.

Description: A large or medium-sized, evergreen tree; young shoots at first brilliant red, then pink and later dark green. Leaves linear-ovate, leathery, more or less glandular punctate, shining above, covered with a fine, powdery, waxy bloom beneath, blade 3-4 in. long. Flowers 2-4 in. across, white and yellow, strongly scented, terminal, solitary or crowded; sepals 4, thick, 2 outer greenish, 2 inner white; petals 4, white; stamens numerous. Fruit ovoid, conical pointed; seeds 1-4, dark brown, smooth and shining.

Distribution: Eastern Himalayas, Chittagong, Khasi Hills, hills of East Bengal, Western Coast, Malabar, Cochin and the Andamans.

Uses: The wood is dark red or deep reddish-brown, strong, hard and durable, not attacked by white ants; it is an excellent pile wood; it is used for bridge construction, railway sleepers, house building, heavy furniture, cart axles, yokes, shafts, ploughs, bows, dugout canoes, keels, helms, oars and masts of boats, well-construction, tool handles, gun-stocks. It is also used for making country pipes and hookas.

The flowers are used for the preparation of an attar; the dried flowers form an ingredient of perfumed ointments; the fragrant stamens are used for stuffing pillows.

The fruit is edible; an aromatic oleo-resin exudes from the unripe fruit.

This is one of the sacred trees of the Hindus.

The bark, roots, dried flower buds and the oil from the seeds are of medicinal value.

179. MICHELIA CHAMPACA LINN.

Family: *Magnoliaceae*

Local Names: Champa, champaca, champo.

English Names: Golden Champa, Yellow Champa.

Description: A large, evergreen tree; bark smooth, grey.

Leaves ovate, lanceolate, entire, shining above, pubescent when young, glabrate when mature; blade 8-10 in. long. Flowers axillary, yellow, strongly scented, 2 in. across; buds silky; perianth segments 15-20. Fruiting spike 3-6 in. long; capsules thick, grey ovoid; outer coat covered with raised, white, rough dots; seeds scarlet or brown.

Distribution: Wild in Nepal, Sikkim, Eastern Himalayas, Assam, the Western Ghats, and southern parts of the Peninsula.

Uses: It is a very useful plant. The wood is olive-brown in colour, beautifully mottled, soft and light, and takes a good polish; it is durable, especially underground, and does not readily rot as it contains a bitter deliquescent salt; it is used for cabinet making, ship building, house building, carriages, palanquins, planking, furniture, dugout canoes, oars, ploughs, door panels, tea chests, general carpentry, ornamental carving, moulding, veneers, toys, second grade pencils, beads. Battery separators are usually made of imported wood but recently champa wood has been shown to be very suitable. In Mysore the wood is used for making drums. A variety of camphor is extracted from the wood by distillation.

The fragrant fresh flowers yield on distillation " champaca oil " of commerce, which is chiefly used in jasmine flower perfumes; the oil contains iso-eugenol. The flowers yield also a dye which is used for dyeing silk and cotton fabrics, and as base for other colours. In Siam an infusion of the flowers is used in the preparation of a cosmetic. The dried flowers impart a fragrance to clothes when placed among them; they are soaked in fatty oils used as hair oils, as the oils absorb the fragrance of the flowers.

A sweet scented water is prepared by distilling the leaves. In Java an oil from the leaves is extracted.

The aromatic " sampanghi " oil of Madras is prepared from champa.

In indigenous medicine the aromatic bark, flowers, fruits and seeds are much used.

180. MIMUSOPS ELENGI LINN.

Family: *Sapotaceae*

Local Names: Borsali, bukul, elengi, maulsari, owli, vavoli.
English Names: Bullet-wood Tree, Indian Medlar.

Description: A middle-sized or large, evergreen tree, bark dark grey, rather rough; trunk cylindric; young parts silky pubescent. Leaves scattered, broadly ovate, leathery, glabrous, dark green, shining above, pale beneath, margins undulate, 3-5 in. long. Flowers greenish-white, sweet scented, axillary, solitary or 2-6-clustered, 0.75 in. across; calyx divided nearly to the base; corolla tube very short, fleshy, lobes linear-oblong, 24 in 2 series. Fruit ovoid, yellow, 1 in. long, 1-seeded.

Distribution: Indian Peninsula from the Northern Circars southwards on the east and from the Konkan southwards on the west.

Uses: The wood is dark red, strong, durable, takes a good polish; it is considered to be one of our strongest woods; it is used for house building, bridge construction, piles, carts, shaft-axles, naves of wheels, boats, rice pounders, cabinet work, walking sticks; it makes excellent fuel.

The bark contains 3-7 per cent of tannin; it is used as a tan and for dyeing cloth various shades of brown, either by itself or along with that of " ain " or " saj " (*Terminalia tomentosa*).

An aromatic volatile oil is obtained from the flowers; it is used in the manufacture of perfumes.

The fruit is edible. The oil extracted from the seeds is used in cooking and as a luminant; painters also make use of this oil.

The bark and the seed oil are used in indigenous medicine.

181. MITRAGYNA PARVIFOLIA KORTH.

Syn. Stephegyne parvifolia Korth.

Family: *Rubiaceae*

Local Names: Kaddam, kaim, kangei.

Description: A large, deciduous, pubescent or nearly glabrous tree; bark light grey, smooth, exfoliating in irregular scales. Leaves opposite, variable in shape and size, ovate or obovate, 2-6 in. long, dark green above, pale beneath, glabrous. Flowers small, numerous, in globose heads, pale yellow or white, 1 in. diam., sweet scented, terminal, solitary. Heads of fruits about 0.6 in. diam., consisting of small, ribbed, oblong, 2-valved capsules; seeds numerous.

GIRLS COLL

Distribution : Throughout tropical India and parts of Pakistan.

Uses : The wood is light, pinkish brown, moderately hard, durable if not exposed to wet, takes a good polish; it is used for building purposes, furniture, agricultural implements, combs, cups, spoons, carving and turning, cement barrels, and various other purposes; in some places the wood is used for making dugout canoes.

From the bark is extracted a fibre suitable for cordage.

182. MORINDA ANGUSTIFOLIA ROXB.

Family : *Rubiaceae*

Local Names : Ban hardi, chenrung, daruharidra.

Description : An erect, glabrous bush or small tree. Leaves large, elliptic or obovate-lanceolate, up to 12 in. long, glabrous or downy on the nerves beneath. Flowers very numerous, white, fragrant, on long or short stalks, solitary, leaf opposed or terminal. Drupes 1 in. diam., free, cone-shaped, black.

Distribution : Tropical Himalayas, wild from Nepal eastwards to Assam, Khasi Hills, Naga Hills, Chittagong; also cultivated in these places.

Uses : A yellow dye is extracted from the bark and the wood; it is generally used by the local people of Darjeeling and Assam.

183. MORINDA TINCTORIA ROXB.

Family : *Rubiaceae*

Local Names : Ack, al.

English Names : Indian Mulberry, Togari Wood of Madras.

Description : A small or medium-sized tree, usually pubescent or tomentose; branchlets grooved; bark corky, brown, fissured. Leaves opposite, broadly elliptic or lanceolate, membranous, slightly leathery, tomentose on both surfaces, not shining, 2-8 in. long. Flowers white, sweet scented, in dense, globoid or ovoid heads or in short, terminal panicles. Fruit of many drupes, coalescent in green fleshy head, irregularly globose or ellipsoid.

Distribution : Throughout the greater part of India, south of the Gangetic Plain, Bengal and Assam.

Uses: The wood is variegated red and white or yellow, hard and durable; it is used for making yokes, combs, gun-stocks, plates and similar utensils.

The tree is best known for the dye contained in the bark and roots; the finer roots are generally preferred to the thicker ones. The dye is red and yellow and is used in plain dyeing; it also forms one of the principal colours in stamping in different fancy patterns; the dye is chiefly used for carpets, handkerchiefs, turbans, etc.

The green fruits are used as a vegetable.

184. MORINGA OLEIFERA LAM.

Syn. M. pterygosperma Gaertn.

Family: *Moringaceae*

Local Names: Sainga, sajana, segva.

English Names: Ben Tree, Drumstick Tree, Horse Radish Tree.

Description: A small, unarmed tree; bark thick, grey, corky, longitudinally cracked. Leaves 3-pinnate, 12-30 in. long, main axis and its branches jointed, slender, glandular at the joints; leaflets glabrous, entire. Flowers white, scented, in large, axillary, downy panicles. Pods pendulous, 9-ribbed, 9-18 in. long; seeds 3-angled, winged at the angles.

Distribution: Wild in forests of West Himalayas, and Oudh; in the Siwalik region in the eastern Punjab; commonly cultivated throughout India and Pakistan.

Uses: The wood is soft, white and spongy, and of no commercial value. The bark yields a coarse fibre which is used by the local people where the tree is found in abundance for making ropes and cordage.

The most valuable part of the tree is the seed from which is extracted the clear, sweet " ben oil " of commerce; this oil is chiefly used by perfumers as a fixative of perfumes, and in the preparation of hair dressings; as the oil does not freeze readily it was formerly greatly valued by watch-makers for oiling fine machinery; the oil is edible. The oil cake is used as a fertilizer.

There is a free exudation of gum from wounds in the bark; this gum is known as " mocharas "; it is used in calico-printing and as a substitute for "tragacanth" which it resembles.

The twigs and leaves are lopped for fodder; they are also used as vegetables, as also the pods and flowers. The powdered leaves are used for cleaning utensils and scrubbing walls.

The tree contains an alkaloid, similar to that found in *Ephedra* spp., but it is not known if it is true ephedrine.

The seeds are the true ben-nuts of ancient writers of materia medica. The various parts of the tree have many medicinal uses.

185. MORUS ALBA LINN.

Family: *Moraceae*

Local Names: Satur, tul, tut, tutri.

English Name: White Mulberry.

Description: A small or moderate-sized, deciduous tree; bark brown, rather rough. Leaves varying a great deal in shape and size, ovate, dentate, often lobed, 2-4 in. long. Flowers unisexual, both male and female on the same tree, greenish; male spike downy, 1 in. long, flowers not crowded; female spike solitary, ovoid, stalked. Fruit up to 2 in. long, white or red, sweet.

Distribution: Sub-Himalayan tract from Kashmir to Sikkim, Baluchistan up to 11,000 ft.

Uses: The wood is orange-brown and hard; it is used for house building, furniture, tea chests, boats, agricultural implements, and turnery. Of late the wood is in great demand for the manufacture of sporting requisites like cricket stumps and bails, cheap cricket bats, hockey sticks, tennis and badminton rackets and presses. Bobbins, picking arms, reels, spokes, poles, shafts and bent parts of carriages are also made out of the wood.

The fibrous bark has been used in China for making paper from olden times.

The leaves are fed to silk worms and to cows in milk.

186. MURRAYA PANICULATA JACK.

Syn. M. exotica Linn.

Family: *Rutaceae*

Local Names: Atal, bisar, juti, kamini, marchula.

English Names: Chinese Box, Chinese Myrtle, Satin Wood.

Description : An evergreen shrub or small tree; bark grey; young parts pubescent. Leaves dark, shining, odd-pinnate, 4-5 in. long; leaflets alternate, ovate or obovate, glabrous. Flowers very fragrant, in terminal cymes; stalks absent; sepals glandular; petals white, gland dotted, 1 in. long, erect, spreading above. Berries 0.5 in. long, globose, red when ripe, usually 2-seeded, seated on the persistent calyx.

Distribution : Indigenous in the Sub-Himalayan ranges, Garhwal to Assam, up to 4,500 ft., and southwards to Chittagong, the Western Ghats, Southern India, Bihar, Utkal (Orissa) and Madhya Pradesh (the Central Provinces).

Uses : The wood is greyish-yellow, hard, and resembles box wood (*Buxus wallichiana*), for which it is often used as a substitute; it is used for wood engraving, turnery, inlay for cabinet work, tool handles, and walking sticks. The wood of the root is very highly prized as it is beautifully figured and so very valuable for kris-handles.

The leaves and the bark are aromatic; the powdered bark is used in the preparation of cosmetics, especially in Burma and Siam, and also as a cure for snake bites; in Java the flowers are used for making cosmetics. They contain the glucosides, murrayin, murrayetin, and indole.

The gum obtained from the burnt wood is used for blackening the teeth by the women of Assam.

The leaves and bark have medicinal uses.

187. MUSA PARADISIACA LINN.

Syn. M. sapientum Linn.

Family : *Musaceae*

Local Names : Kel, kela.

English Names : Adam's Fig, Banana, Fig of India, Plantain.

Description : A herbaceous tree with a long, erect, false stem. Leaves radially arranged, oblong, 4-5 ft. long, bright green above, paler beneath, stalked. Spike drooping; lower flowers female, the upper male; bracts large, ovate, many flowered, deep red coloured; calyx 5-toothed, yellowish-white; petals shorter than the calyx, oblong. Fruit long, sometimes 3-cornered, tapering to the base and apex, fleshy, green, yellow, or red when ripe.

Distribution: Wild in Bihar and eastern Himalayas and Assam; largely cultivated throughout India and Pakistan.

Uses: It is the best known fruit tree, not only in this subcontinent but practically all the world over; in many parts of India, especially in southern India, it is a staple article of diet; according to the variety it is either cooked as a vegetable, in which case it is known as a plantain, or eaten fresh as a dessert, in which case it is known as a banana. The ripe fruit contains antiscorbutic vitamin and vitamin A, but vitamin B is deficient; alcoholic beverages like banana wine, brandy, rum, beer, and other spirits are distilled from the ripe fruit. In some countries the fruit pulp is used for dyeing wool, cotton, silk, leather, and wood. The ash from the dried fruit skin is rich in potash, and so is used for making soap; the dried skin has tanning properties and is used for blackening leather.

Not only the fruit but also some other parts of the plant have many valuable uses. What is commonly known as the stem (the pseudostem) yields a beautiful fibre; it is inferior to manilla hemp, which is extracted from the pseudostem of *Musa textilis*, and is used for making ropes, cordage, fishing tackle, paper mats, etc. The leaves also yield a useful fibre. Small boxes for snuff and drugs are made out of the leaf-stalks. The leaves are used as plates, wrapping material, and temporary thatch for huts. The ashes of leaves and leaf-stalks are used as a detergent for washing clothes and as a substitute for Fuller's Earth. The ashes of the leaves, bark and skin of unripe fruits of some varieties are used in dyeing. The leaves are used for dressing wounds and burns.

The sap is useful as an indelible marking ink.

The various parts of the plant have many medicinal uses.

188. NANNORHOPS RITCHIEANA H. WENDL.

Syn. **Chamoerops ritchieana** Griff.

Family: *Palmae*

Local Names: Fees, maizurrye, mazree, peer putta, pharra.

Description: A low, gregarious palm. Leaves usually tufted from an underground, much branched, thick rhizome, or from an erect branching stem up to 20 ft. high; leaves up to 4 ft.

long and broad, rigid, greyish-green, consisting of 8-15 segments; stalk unarmed up to 12 in. long, rusty-woolly at the base. Flowers unisexual and bisexual in a pyramidal, erect, much branched spadix. Fruit an ovoid or sub-globose, 1-seeded drupe.

Distribution : Common in Sind, Baluchistan, and Peshawar Valley, and in the Punjab up to 5,000 ft. elevation.

Uses : One of the most useful palms of the arid regions. Fans, sandals, baskets, brushes, brooms, etc., are made out of the leaves. The leaves can also be used for making matting, which is superior to that made from the leaves of the date palm (*Phoenix sylvestris*). The leaves yield a fibre which is used for making ropes and cordage, and in Algeria for making paper and paste-board. The woolly scurf covering the petiole is used as tinder when mixed with saltpetre or with the juice of mulberry leaves. The stem and the leaves can be used as fuel. The tender young leaves, inflorescence, and fruits are eaten as pot herbs. The seeds are made into beads.

189. NERIUM INDICUM MILL.

Syn. N. odorum Solander

Family : *Apocynaceae*

Local Name : Kaner.

English Name : Oleander.

Description : A large, erect, much branched shrub. Leaves in threes, entire, lanceolate, 5-6 in. long, leathery, dark green above, pale beneath. Flowers rose-coloured or white, odorous or inodorous, in large, terminal corymbs; calyx deeply divided; corolla tube cone shaped or tubular, lobes spreading, unequal sided; corona 5-7, often divided. Follicles elongate, linear, cylindric, 6-9 in. long; seeds numerous, covered with fine hairs.

Distribution : Wild in Sind, Baluchistan, Western Himalayas, Kashmir, Madhya Bharat (Central India) and plains of the Punjab; cultivated throughout India and Pakistan.

Uses : All parts of the plant are poisonous; they contain two glucosides, nerin and oleandrin. It has been reported that deaths have resulted from the use of the wood as meat skewers. In some parts the wood is used for making hooka tubes.

Cutaneous vermins are destroyed by the application of a leaf decoction. The bark and wood are used in the manufacture of rat poisons.

190. NYCTANTHES ARBOR-TRISTIS LINN.

Family: *Oleaceae*

Local Names: Har, harsinghar, parijattaka, singhar.

English Names: Coral Jasmine, Indian Mourner, Sorrowful Tree.

Description: A large, deciduous shrub, or small tree, roughly hairy all over; branchlets quadrangular; bark thick, rough, pale brown. Leaves opposite, ovate, leathery, dark green and rough above with bulbous, white hairs, paler and tomentose beneath, entire or coarsely toothed, 3-4 in. long. Flowers without stalks, sweet scented, in clusters of 3-5, forming terminal cymes; calyx hairy; corolla lobes 5-8, white, glabrous, corolla tube orange. Capsules flat, glabrous, roundish, 0.5-0.75 in. across, 2-seeded.

Distribution: Wild in the forests of Madhya Bharat (Central India), and Sub-Himalayan and Tarai regions.

Uses: The wood is brown; it makes useful fuel.

The most valuable part of the plant is the flower which opens at night and is shed early morning. The orange coloured tube of the flower is rich in colouring matter, which is readily soluble in water; it is a fleeting colour of a beautiful orange or golden yellow; commonly used as an auxiliary to other dyes; liquors are often coloured with this dye. The flowers are very much used in Hindu worship and as votive offerings.

The bark is used in tanning. The leaves are often used to polish wood in place of sand-paper.

The bark, leaves and flowers have medicinal uses.

191. OCHROCARPUS LONGIFOLIUS BENTH. & HOOK. F.

Family: *Guttiferae*

Local Names: Nag kesar, surgi, suringi.

Description: A large, glabrous, evergreen tree; bark dark grey, scaly; branchlets cylindric or angled. Leaves opposite or

3-whorled, oblong, leathery, 6-8 in. long. Flowers unisexual and bisexual on the same tree, fragrant, white or pinkish, 0.5 in. diam., in axillary, stalked, many flowered clusters; calyx ultimately 2-valvate, reddish; petals thin, 4-7 or more. Fruit obliquely ovoid, 1-4-seeded, 1 in. long, tipped by the hard pointed style.

Distribution : Indigenous in the Konkan and Kanara Ghats, Utkal (Orissa), and Chittagong.

Uses : The wood is moderately hard, reddish-grey, and smooth; it is used for planking, masts and yards of boats.

A dye is obtained from the dry flower buds; it colours silk red; the flowers also yield a perfume resembling violets. The fruit is edible.

The flowers have medicinal uses.

192. OLDENLANDIA UMBELLATA LINN.

Family : *Rubiaceae*

Local Names : Cheddie, cherivelu, emburel, saya.

English Names : Chaya Root, Indian Madder.

Description : An annual herb, diffuse, glabrous or hairy; stem woody, much branched from the base. Leaves often clustered, linear, flat or almost needle-shaped, 0.5-1.5 in. long. Cymes terminal.

Distribution : Western Peninsula, Utkal (Orissa), Bengal, Southern India.

Uses : The herb is of importance because of the valuable dye, similar to " manjit " (***Rubia cordifolia***), contained in its long and orange coloured root. A brilliant, fast, red dye is obtained from the outer bark of the root; it is the best red dye for cotton cloth; chintz of India dyed with chaya root are famous. This dye is very much used in South India for dyeing fabrics, especially rumals for which Madras was once famous; Madura is celebrated for its red turbans which are dyed with chaya root. The root also yields a purple and brown orange dye.

The leaves are used medicinally as an expectorant.

193. ONOSMA ECHIOIDES LINN.

Family: *Boragineae*

Local Names: Lal-jari, maha-ranga, ratanjot.

Description: A biennial, bristly herb. Leaves alternate, oblong, 2.5 in. long. Racemes elongate, often forked; corolla cylindric, slightly dilated upwards, 0.25 in. diam. at top, glabrous. Racemes in fruit 1-6 in. long, bracts 0.5-1 in. long, leaf-like. Nuts up to 0.25 in. long, stony, white, often speckled, shining, smooth.

Distribution: Throughout the Western Himalayas from Kashmir to Kumaon.

Uses: The useful part of the herb is its roots which yield a dye; it is used in the North-West Himalayas to dye wool red; in some places it is also used for colouring images; the Nepalese colour their hair with this dye mixed with oil; pharmaceutical preparations, such as Macassar oil, are coloured with this dye.

The leaves and roots are used in indigenous medicine.

194. OROXYLUM INDICUM (LINN.) VENT.

Family: *Bignoniaceae*

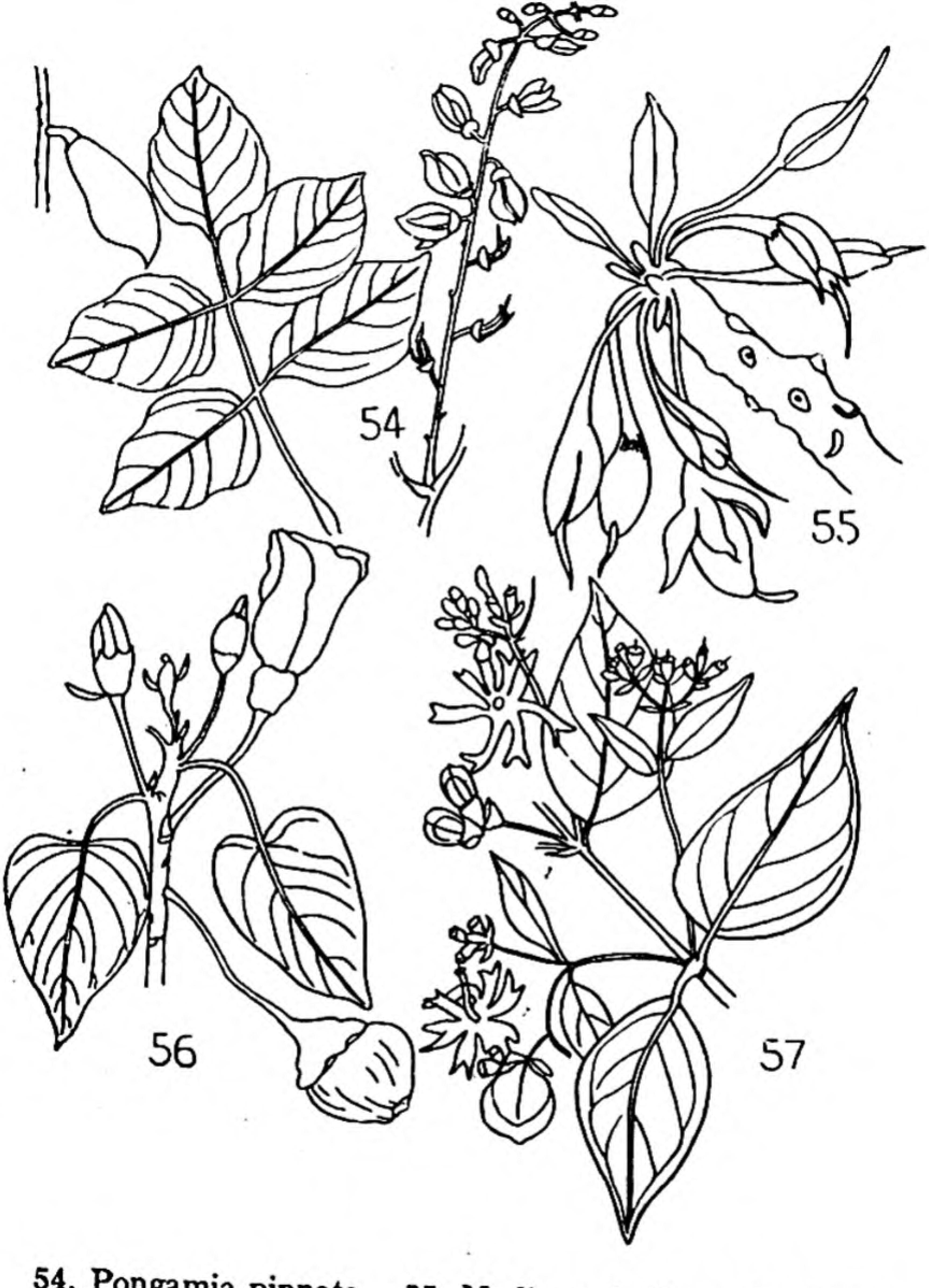
Local Names: Arlu, pana, tetu, ullu.

Description: A small, deciduous, glabrous tree; bark light-brown, soft. Leaves very large with a stout main axis, opposite, 2-3-pinnate, 4-6 ft. long; leaflets stalked, ovate or elliptic, 3-8 in. long, entire. Flowers large, in erect, terminal, 1-2 ft. long cymes, purple, foetid. Capsules 1-2.5 ft. long, tapering at both ends, flat, woody, dark brown; seeds numerous, winged, 2-3 in. across.

Distribution: Throughout Tropical India and Pakistan in moist forests.

Uses: In some countries the timber is used as match wood. The bark and the pods are of value in dyeing and tanning. The seeds are useful as a lining for hats and as a stuffing material between layers of wicker-work to make umbrellas.

The root bark is of medicinal use.



54, Pongamia pinnata. 55, Madhuca indica. 56, Thespesia populnea. 57, Nyctanthes Arbor-tristis.

195. OUGEINIA DALBERGIOIDES BENTH.

Syn. Dalbergioides ougeinensis Roxb.

Family: *Leguminosae*

Local Names: Kala-phulas, sandan, tewas, timsa, tinnas.

Description: A small, moderate-sized tree; bark thin, light brown, with horizontal cracks, scaling off in regular shaped patches. Leaves odd-pinnate; leaflets 3, pubescent, broadly ovate, sinuate or crenate, laterals almost without stalks, terminal stalked, 2-6 in. long. Flowers numerous, in clustered racemes from the old wood, 1-2 in. broad; buds and bracts densely tomentose; calyx 2-lipped; corolla white or rose-coloured. Pods jointed, 2-3.5 in. long, joints 1-3 glabrous, flat, deeply indented on one side.

Distribution: Common in Madhya Pradesh (the Central Provinces), Madhya Bharat (Central India), and the Deccan; found from the Ravi eastwards to Bhutan, and parts of Bombay and Madras in deciduous forests up to 4,000 ft.

Uses: The wood is at first golden-brown, ageing to reddish-brown, mottled, handsome, hard, elastic and tough; it takes a good polish; it is not readily attacked by white ants; it is a valuable timber and is in great demand for carts, carriages, shafts, yokes, axles, naves, spokes and felloes of wheels, naves of solid cart wheels, furniture, agricultural implements, well construction, carving, turning, coopers' work, shuttles, spindles and other articles where toughness is required; it is one of the finest woods for " lager-bier " casks and hogshead.

The bark is used to intoxicate fish; the astringent gum that exudes from it is similar to " Dragon's Blood." The bark yields a fibre useful for making ropes.

The bark and the leaves are considered to be effective for the control of caterpillar pests.

The twigs are used as cattle fodder.

196. PALAQUIUM ELLIPTICUM ENGL.

Syn. Dichopsis elliptica Benth.

Family: *Sapotaceae*

Local Names: Halganne, halusalla, hodsale, palla, panchonta.
English Name: Indian Guttapercha Tree.

Description: A lofty tree, reaching a height of over 100 ft.; young shoots, flower stalks and calyx minutely rusty pubescent. Leaves near the ends of branches, elliptic or obovate-elliptic, blade 3-5 in. long. Flowers in axillary clusters of 2-8, stalked. Fruit ellipsoid, fleshy, 1.5 in. long.

Distribution: Common in the evergreen forests of the Western Ghats from North Kanara southwards.

Uses: The wood is light red to reddish-brown, durable, moderately hard. It is used for house building, shingles, coopers' work, rubber chests, guide skids in mines, masts, spars, scantlings, planks, reapers, shafts and frames of carts; in Malabar it is also employed for making cheap furniture.

The oil extracted from the seed is valuable; it is useful for soap-making and as a luminant.

The milky juice from the tree is used for water-proofing and as a cement; it also serves as an adulterant for latex rubber (*Hevea brasiliensis*).

197. PANDANUS TECTORIUS SOL.

Syn. P. odoratissimus Roxb.

Family: *Pandanaceae*

Local Names: Gagandhul, keora, ketgi, mugalik.
English Names: Nicobar Bread-fruit, Screw-Pine, Umbrella Tree.

Description: A tall, gregarious shrub or small tree; bark smooth, light brown, shining; stem rarely erect, much branched, resting on strong, aerial roots. Leaves sword shaped, surrounding the stem at the base, leathery, spiny on edges and mid-rib, 3-5 ft. long, spirally arranged. Flowers unisexual, both male and female flowers on the same plant; male spadix with numerous, cylindric spikes, enclosed in long, white, highly fragrant spathes; female spadix solitary, 2 in. diam., enclosed in yellow spathes, carpels joined together in groups of 5-12, green. Fruit oblong or globose, 6-10 in. long, yellow or red when ripe, drooping.

Distribution : Common in the tidal forests of the Sunderbans, on the sea-coast of South India and back-water canals of Travancore; also found in the Andamans.

Uses : The various parts of the plant are of commercial value. The leaves are woven into mats, sugar bags, umbrellas and hats; they are also used for thatching and for paper making. A valuable fibre is extracted from the leaves; it is made into cordage, fishing nets, fishing lines, hunting nets, brush bristles and sacking. The fibrous aerial roots are used for tying baskets, and for making mats, baskets, hats, brushes for white-washing and painting and corks.

The part of the plant most popularly known is the male inflorescence, because of its fragrance. Keora oil is obtained from the flowers; one of its chief uses is to flavour " kath " or catechu; keora attar is of value to perfumers. The fragrant floral leaves are eaten as a vegetable. The fruit is used for hackling thread; the orange red pulp of the fruit is edible.

In the back-water canals of Travancore keora is planted as a soil binder.

The leaves and keora oil have medicinal uses.

198. PEGANUM HARMALA LINN.

Family : *Rutaceae*

Local Names : Harmara, hurmur, isband-lahouri.

English Name : Syrian Rue.

Description : A densely foliaged, bushy, glabrous, perennially rooted, 1-3 ft. high shrub; stem branching in pairs, stout, flexuous. Leaves alternate, 2-3 in. long, green, divided many times, segments linear. Flowers axillary, solitary, with or without stalks, 0.5-0.75 in. across, white with green veins. Capsules globular, up to 0.5 in. diam., 3-4-celled.

Distribution : Common in the dry, waste places and fields of Baluchistan, Waziristan, Kurum Valley, Sind, the Punjab, Kashmir, Uttar Pradesh (the United Provinces), Bihar, and Western Deccan.

Uses: A red dye is extracted from the seeds; it gives shades of brown and black; the seeds contain the alkaloids harmine, harmaline, harmalol, and peganine. The smoke from the burning plants serves as a mosquito repellent and as a disinfectant. Vermin in the hair is destroyed by the application of a mixture of powdered roots and mustard oil.

The plant has medicinal uses.

199. PHOENIX DACTYLIFERA LINN.

Family: *Palmae*

Local Names: Khaji, khajur, mach.

English Names: Date Palm, Edible Date.

Description: A tall palm, up to 120 ft. high; stem clothed with the persistent bases of leaf-stalks; a dense mass of root suckers arising from the base of the stem. Leaves pinnate; leaflets 8-16 in. long; leaf-stalk laterally compressed, almost flat. Flowers unisexual; male panicles, white compact, 6-9 in. long; inflorescence stalk short; flowers fragrant, very small; female spike 12-24 in. long; stalk up to 0.5 in. broad. Fruit oblong, 1-3 in. long, reddish or yellowish-brown when ripe, flesh thick and sweet; seed cylindrical with a long furrow on one side. The root suckers, longer leaves and more fleshy and sweeter fruits distinguish this species from its allied species, *P. sylvestris*.

Distribution: Found in South Punjab, Sind, Sagar Doab, and Trans-Indus territory.

Uses: This palm tree of the Scriptures is of great importance. The trunk is lighter than that of the cocoanut palm (*Cocos nucifera*) or palmyra palm (*Borassus flabellifer*); it is used for doors, door posts, beams, planks, water channels, bridge building, etc.

The leaves are woven into mats, baskets, bags, fans, etc., and find a ready use for thatching. The leaf-stalks are used for making walking sticks, crates and baskets. The base of the leaf-stalk surrounding the stem is in the form of a fibrous net-work, known as "kabal" or "khajur-ka-bokla"; it is used as a pack-saddle for oxen; the fibre obtained from this sheathing base is made into cordage.

The fruit is the well-known date. It is not only used as a dessert in various parts of the world, but is a staple article of diet in Egypt, Arabia, and Iran, both of man and beast. A preserve is made from the fruit; the powdered stone is camel food; the stone softened by soaking in water is fed to cattle. A treacle made out of the ripe fruits is used for coating leather. From the fresh flower heads is distilled " tara " water for making sherbets.

A gum, known as " kukm chil," obtained from the palm has medicinal uses; the seeds also have medicinal properties.

The cabbage or the tender head of the palm is locally known as " gaddah," " gari " or " galli "; it is considered a delicacy.

200. PHOENIX SYLVESTRIS ROXB.

Family: *Palmae*

Local Names: Khajuri, sendi, sendri, sindi.

English Names: Date Sugar Palm, Wild Date Palm.

Description: A tall, graceful palm; trunk rough from the persistent bases of the leaf-stalks; crown hemispherical. Leaves **10-15** ft. long, greyish-green glabrous, pinnate, axis compressed towards the apex, bearing at the base a few, channelled, triangular spines up to **4** in. long; leaflets numerous, **6-18** in. long, covered with a fine bloom, rigid, sword-shaped. Flowers unisexual, male and female flowers on different individuals; male flowers white, scented, spadix **2-3** ft. long, erect, stalk of the spadix highly compressed, short, spathe leathery, almost woody, scurfy, separating into 2 boat-shaped valves; female spikes **1-2** ft. long, arranged in distinct groups, spathe and spadix as in the male. Fruit spadix **3** ft. long; fruit scattered on long, pendulous spikes, golden orange coloured, about **1** in. long; flesh sweet and scanty.

Distribution: Common throughout India and Pakistan; wild or cultivated.

Uses: The wood is used for making water-pipes, building purposes, and turning.

The leaves are useful as a thatching material and are woven into mats, baskets, bags, fans, etc. The fibrous leaf-stalks are used for making paper and cordage; they are beaten and twisted into ropes for drawing water from wells. The sacking-like base of the leaf-stalk which surrounds the stem is used as a pack-saddle for oxen.

The fruit resembles the true date (*Phoenix dactylifera*), but the stone is much bigger, the flesh less sweet and less thick. In some of the desert parts of the country the fruit is the staple food of the local people. The seeds are eaten to relieve thirst.

The palm is best known for its valuable juice which is rich in vitamins; the juice is either used as a beverage or converted into sugar by refining the " gur " prepared by boiling.

201. PICEA MORINDA LINK.

Family: *Coniferae*

Local Names: Achara, kachal, morinda, rau.

English Name: Himalayan Spruce.

Description: A tall, evergreen, conical tree; branches horizontal, with hanging, tassel-like branchlets; bark greyish-brown, divided by shallow cracks into small 4-sided scales; foliage blue or grey-green. Leaves scattered round the branches, needle-like, 4-sided, 1-1.5 in. long. Male and female cones on the same tree; male cones single, erect, 1 in. long, without stalk, in the axils of the upper leaves; female cones terminal, single, erect, ovoid-oblong. Fruit cones cylindric, pendulous, dark brown, 4-6 in. long.

Distribution: Himalayas 6,000-11,000 ft. from Bhutan westwards, Kurum Valley at 8,000-12,000 ft.

Uses: The wood is usually white, soft to moderately hard. It is an excellent substitute for imported deal woods; it is used for internal wood-work, house building, packing cases, tea chests, water troughs, rough furniture. The wood yields a good wood-pulp for making paper. The wood is also useful in the match industry for making match boxes, match sticks, and peelings.

202. PINUS EXCELSA WALL.

Family: *Coniferae*

Local Name: Kail.

English Name: Blue Pine.

Description: A large, evergreen tree; bark smooth and slate coloured on young tree, rough and shallow fissured on mature tree; foliage blue- or grey-green. Leaves in clusters of 5, drooping, slender, 5-8 in. long. Male cones ovoid, about 0.3 in. long; female cones usually 2 or 3 together; fruiting cones cylindric, erect at first, later becoming pendulous, 6-10 in. long, tip of scales slightly thickened, beak obtuse.

Distribution : Temperate Himalayas from Bhutan westwards at 6,000-12,500 ft.

Uses : The wood is pinkish-red to light red, moderately hard and highly resinous; it is the best of our pines; it is specially used for house building, carpentry of all kinds, packing cases, tea chests, shingles, small solid wheels of trucks, camp furniture, spoons, cups, etc. It finds extensive use for match sticks and match boxes. The wood can also be used for making bodies of violins. Kail can be used for all purposes for which the American and European deal woods are used.

Turpentine and tar are obtained from this pine. This tar is equal to the best Swedish tar; it is applied to wood-work as a protective varnish.

A sugary manna, which is eaten by the local inhabitants, exudes copiously from the leaves and twigs.

The bark contains a colouring matter, but its commercial value has not been established.

203. PINUS LONGIFOLIA ROXB.

Family : *Coniferae*

Local Names : Chil, chir, dhup, sala-dhup.

English Name : Long-Needled Pine.

Description : A tall tree; branches symmetrically whorled high up the straight trunk; bark 1-2 in. thick, deeply fissured into large plates; foliage light green when young, darker afterwards. Leaves in clusters of 3, slender, 9-12 in. long, nearly 3-sided. Male cones cylindric, 0.75 in. long; female cones on short, stiff stalks, solitary or in clusters of 2-5. Fruiting cones ovoid or conical, 4-7 in. long; tip of scales much thickened, lobed, beak pointed.

Distribution : Outer Himalayas and Siwaliks, chiefly Himalayan valleys at 1,500-7,500 ft.

Uses : The wood is reddish-brown, light and moderately hard; it is a well-known pine wood and is second to deodar (*Cedrus Deodara*) in utility; in northern India " chil " is used more than any other wood; it is an all-round timber; it is extensively used for house building, oars, coopers' work, common furniture, tea chests, boat building, general carpentry, cheap joinery, and internal fittings; it is also in great demand for various sporting requisites and bodies of violins; in the match industry also it is very much used.

Chir is also of great commercial importance as it is the chief source of resin in India and Pakistan. The resin is known as "ghandbiroza." There are two forms of this resin, the "birja" or "berja" and "bakhar-birja"; the former (birja) exudes naturally in the form of tears from the bark; the latter (bakhar-birja) is artificially tapped from the sap wood; bakhar-birja is chiefly used by bangle-makers. Ghandbiroza yields a tar, which on distillation produces turpentine.

The bark contains 11-14 per cent of tannin, and is used in tanning; it also contains a colouring matter which dyes tassar silk a yellowish shade, and wool a rich orange.

An ink is made by mixing leaf-charcoal with rice water.

The seeds, known as "syuta," are edible.

Ghandbiroza has medicinal properties.

204. PISTACIA INTEGERRIMA STEWART

Family: *Anacardiaceae*

Local Names: Kakkar, kakar-singi, karkar.

Description: A glabrous tree. Leaves pinnate, 6-9 in. long; leaflets 7-11, nearly opposite, stalked, lanceolate, 2.5-5 in. long, entire, base unequal, young foliage red. Flowers red, unisexual, male and female flowers on different trees, in lateral panicles; petals absent; male flowers: calyx 5-lobed, anthers deep red; female flowers: calyx 4-lobed, soon falling off. Drupes glabrous, wrinkled, globose, 0.25 in. diam., grey when ripe.

Distribution: North-Western Frontier, Peshawar Valley, Salt Range and the Western Himalayas from the Indus to Kumaon at 1,000-8,000 ft.; cultivated in the plains.

Uses: The wood is brown, striped with yellow and dark veins, extremely handsome, hard, durable, and takes a fine polish; it is used for furniture, spinning wheels, roofing, tonga boards, and ploughs.

The valuable part of the tree is the horn-like, hard, rugose galls produced on the leaves and leaf-stalks as a result of insect attack; these "horns" are of great commercial value; their tannin content varies from 20-75 per cent; they are used for dyeing and tanning. The leaves also contain tannin to the extent of 16 per cent.

205. PLUMERIA ACUMINATA AIT.

Syn. P. acutifolia Poiret.

Family: *Apocynaceae*

Local Names: Chameli, champa, gulachin, son champa.

English Names: Pagoda Tree, Temple Tree.

Description: A small, fleshy, deciduous tree with milky juice; branches swollen, cylindric, glabrous; bark grey, smooth, scaly. Leaves in crowded spirals at the tips of branches, obovate-oblong, 8-12 in. long, tapering at both ends, leathery, glabrous above, more or less pubescent beneath. Flowers in upright clusters at the tips of branches, very fragrant, large, waxy white, with a golden centre; corolla funnel shaped; petals 5, tinged with pink below. Follicles about 5 in. long, cylindric.

Distribution: Introduced in India and Pakistan; widely grown, especially near temples.

Uses: The wood is yellowish-white and soft; useful for making Indian drums, tomtoms and similar other musical instruments. The flowers are in great demand for votive offerings to gods by Hindus.

All the parts of the plant are much used in indigenous medicine.

206. POGOSTEMON HEYEANUS BENTH.

Syn. P. Patchouli Hook. f.

Family: *Labiatae*

Local Names: Pachouli, peholi.

Description: A strong, aromatic, erect herb, 2-3 ft. high; stem softly hairy, branched. Leaves long stalked, ovate, crenate or toothed or incised, 2-3 in. long, membranous, leaf-stalk

0.5-1.5 in. long. Flowers in dense, globoid whorls, 0.5 in. diam., forming interrupted spikes, 3-6 in. long; flowers very small.

Distribution : Wild and cultivated in the Western Ghats; also in the Nilgiris and Central India.

Uses : The herb is of great commercial value because of its aromatic contents. The dried branches constitute the patchouli of commerce; an essential oil, the oil of Patchouli, is extracted from the herb; it is extensively used in perfumery; patchouli perfume is a favourite all over Asia. In Kashmir, dried leaves and branches are commonly used to scent shawls; they are also employed for scenting linen and other clothes. The dried branches are also used for flavouring country spirit.

207. PONGAMIA PINNATA (LINN.) PIERRE

Syn. P. glabra Vent.

Family : *Leguminosae*

Local Names : Karanj, kiramal, papar.

English Names : Indian Beech, Poonga Oil Plant.

Description : A moderate-sized, almost evergreen tree; bark soft, grey, covered with tubercles; crown rounded. Leaves odd-pinnate, 5-14 in. long, glabrous, bright green; leaflets 5-9 opposite, shining on both surfaces, ovate or elliptic, 2-5 in. long. Flowers purple and white in axillary racemes. Pods woody, glabrous, turgid, oval-oblong, with a short, decurved, lateral beak, 1.5-2 in. long, 1-2-seeded.

Distribution : Throughout India and Pakistan, especially along banks of streams and in tidal and beach forests; common in Central and Southern India.

Uses : The wood is at first white turning to yellow later, moderately hard and not durable. It is used for building purposes, ploughs, combs, yokes, oil-mills, solid cart wheels and fuel. The ash of the wood is used for dyeing in Chhota Nagpur. The bark yields a coarse fibre.

A useful oil, known in some places as honge oil, is extracted from the seeds; it is much used by villagers as an illuminant; the oil has insecticidal properties and is used as an insecticide, especially against coffee green bug; it is also used in soap making. The seeds are used as fish poison; the roots also have similar action against fish.

In southern India the leaves are used as manure in rice fields.

208. PREMNA TOMENTOSA WILLD.

Family: *Verbenaceae*

Local Names: Ije, narve, podanganari.

Description: A small or medium-sized, deciduous tree; bark greyish-brown; branchlets, leaves, and inflorescence densely clothed with soft, tawny tomentum. Leaves ovate, acuminate, entire, blade 5-8 in. long. Flowers yellow; calyx 2-lipped, very hairy in the throat, leathery.

Distribution: Rajmahal Hills, Mysore, Chhota Nagpur, Utkal (Orissa), Deccan Karnatic.

Uses: The wood is thin, light, yellow-brown, smooth and hard; it is used for turning, ornamental purposes, carving, fancy work and weavers' shuttles; it is chiefly employed for making combs; it is also very useful as firewood.

The aromatic leaves are used as dinner plates. The tree is lopped for cattle fodder.

The leaves have medicinal uses.

209. PTEROCARPUS INDICUS WILLD.

Family: *Leguminosae*

Local Name: Padauk.

English Name: Andaman Padauk.

Description: A tall tree with ascending, glabrous branches. Leaves 6-9 in. long; leaflets 7-11, ovate, 2-4 in. long, alternate, glabrous. Flowers in copious panicles, clothed with firm, brown pubescence, stalks small; calyx small, fine, brown, silky; corolla yellowish. Pods rounded, 2 in. diam., silky, winged, 1-seeded, beaked.

Distribution: Andaman Islands, Eastern and Western Peninsula.

Uses: The timber is very variable in colour, light yellowish-pink to brick-red or rich crimson, often streaked dark red or black; it is moderately heavy, very durable, resistant to white ants, and polishes well; it is a very valuable ornamental wood and is much employed for decorative purposes, such as interior fittings in buildings, railway coaches and ship saloons, furniture, and cabinet-work; it is also used for billiard tables, wheelwrights' work and carriages; it is preferred for counter-tops in banks and other places where there is a great deal of wear from coins. It has been tried and found suitable for aircraft propellers.

210. PTEROCARPUS MARSUPIUM ROXB.

Family: *Leguminosae*

Local Names: Asan, bibla, bija, bijasal.

English Name: Gum-kino Tree.

Description: A large, deciduous tree; branches spreading; bark grey, exfoliating in small irregularly sized pieces. Leaves 6-8 ft. long, pubescent while young; leaflets 5-7, dark green, shining above, paler beneath, leathery, elliptic, 3-5 in. long, glabrous when full grown. Flowers pale yellow or white, in short, panicled racemes, main and secondary flower stalks thinly clothed with brown pubescence. Pods nearly round, 1-2 in. diam., glabrous, winged, beaked at the basal corner, 1-seeded.

Distribution: Chiefly in Peninsular India; in deciduous forests between 500 and 1,500 ft.; also in parts of Kumaon, Oudh, and Madhya Bharat (Central India).

Uses: The wood is yellowish-brown, very hard, durable, and takes a fine polish; in Southern India it is highly valued and is ranked after teak (*Tectona grandis*) and blackwood (*Dalbergia latifolia*), the wood is prized for high class constructional and ornamental work and superior class of furniture; it is also used for agricultural implements, carts, cart wheels, boats, oars, drums, toys, combs, coopers' work, grain measures, carving, pit props in coal mines, and joiners' work.

Another valuable produce of the tree is the red gum, "kino" of commerce, that exudes from the bark; kino is very valuable; it is extensively used as a medical gum; it contains 75 per cent of tannic acid; it is used also in the preparation of some European wines.

The bark contains a brownish-red substance which is at times used for dyeing.

The leaves make good cattle fodder.

211. PTEROCARPUS SANTALINUS LINN. F.

Family: *Leguminosae*

Local Names: Lal chandan, rakta chandan.

English Names: Red Sandal Wood, Red Sanders.

Description: A pretty, moderate-sized tree. Leaflets 3, rarely 4 or 5, broad-elliptic, 1.5-3 in. long, pale and pubescent beneath. Flowers few, in short racemes. Pod 1.5 in. long, oblong, gradually narrowed into a short stalk, silky at first, centre turgid, winged, beak near the base.

Distribution: Dry hills of the eastern Deccan from the Godaveri to the Palar River.

Uses: The wood is dark claret-red, almost black, extremely hard; it is considered resistant to white ants; as timber it is highly valued; it is chiefly used for construction of house posts, cart shafts, yokes, spokes and felloes of wheels, plough shafts, agricultural implements, ornamental boxes, picture frames, carvings, idols and figures for temples.

The wood is not only valuable as timber but also as a dye wood; it contains a red colouring resinous substance, "santalin," soluble in alcohol, essential oils or ether, but not in water; it is used as a dye, producing a fast, salmon pink colour on cloth; lal chandan is very valuable for dyeing leather red, staining wood and in calico-printing; pharmaceutists find it very useful as a colouring agent. With sappan wood (*Caesalpina sappan*) this wood is employed in India and Pakistan for dyeing silk and cotton. Different colours like carmine blue, scarlet red, deep violet or brown, can be produced on wool, cotton and linen according to the mordant used.

The wood is astringent and has many medicinal uses.

212. PTEROSPERMUM ACERIFOLIUM WILLD.

Family: *Sterculiaceae*

Local Names: Kanak-champa, karnikara, kath-champa.

Description: A tall, evergreen tree; bark thin, smooth, ash coloured; branchlets and inflorescence clothed with ferruginous tomentum. Leaves large, obovate, variable in shape, coarsely toothed, glabrous above, white tomentose beneath, blade 10-14 in. long. Flowers very large and fragrant; sepals linear, brown tomentose without, paler within, 6 in. long; petals white, shorter than sepals. Capsules 4-6 in. long, 5-angled, brown tomentose; seeds numerous, winged.

Distribution: Sub-Himalayan regions from the Jumna to Bengal, Chittagong and the Konkan.

Uses: The wood is light red or brown, moderately hard and heavy, and takes a fine polish; it is useful for making furniture, tea chests, matches, match boxes and planks.

The leaves are used as plates and for packing tobacco.

The tomentum covering young branches and inflorescence is used to stop bleeding.

In Bengal, the flowers are used as a disinfectant and insect repellent.

213. PUNICA GRANATUM LINN.

Family: *Punicaceae*

Local Names: Anar, dalim, dalimba, darun.

English Name: Pomegranate.

Description: A large, deciduous shrub or small tree; bark greyish or pale brownish; branchlets spinescent; buds and young shoots red. Leaves opposite, often clustered on arrested branchlets, without stalks, wavy, oblong or lanceolate, 1-3 in. long, glossy green with red veins. Flowers terminal, large, deep red coloured, solitary or in twos, threes or fives; calyx thick, fleshy, red coloured; petals 5 or 7, large, crumpled, bright scarlet coloured. Fruit globular, faintly 6-sided, crowned by the persistent calyx; seeds numerous, each embedded in a sweet, pellucid pulp; rind smooth, hard, leathery, red or brownish.

Distribution: Common all over India; wild in Kashmir and North-Western Himalayas; cultivated in many parts of India.

Uses: The wood is light yellow and hard; in the opinion of some it is a good substitute for boxwood for engraving. Walking sticks are made out of the branches.

The plant is best known for its fruit which from ancient times has been highly prized; it is valued both as food and dessert. Delicious beverages are made from the seeds; a wine with the flavour of raspberry is prepared from the fermented seeds. The dried rind of the fruit is known as "naspal"; it contains tannin, extractine and mucilage; it yields a fast yellow colour—golden brownish yellow shade; there are several plants which give vegetable yellow colours, e.g., harshingar (*Nyctanthes Arbor-tristis*), annato (*Bixa orellana*), palas (*Butea monosperma*) turmeric (*Curcuma domestica*), etc., but all these are fleeting whereas only naspal yields a permanent yellow dye. The dried rind is often employed in conjunction with other colouring agents like turmeric (*Curcuma domestica*) or indigo (*Indigofera tinctoria*); it is also used alone to dye cloth a greenish colour, known in Uttar Pradesh as "kakrezi." The rind is also a very valuable tan and is used for tanning and dyeing morocco leather.

The flowers were known to the ancients as "balustine" or "balaustium"; they contain a dye and a tannin; the dye colours cloth red, but it is a fleeting colour; they are also used as an astringent; in China they are used in the fermentation of wine. The flowers of the male plant are used as a styptic by Arabs.

The bark, like the dried rind of the fruit, is valuable for tanning and dyeing morocco leather.

The root bark contains 22 per cent of tannin and is used for making jet black writing ink; the bark and the rind of the fruit are used by Moroccans for making hair dyes, and by Annamites for making lacquer for teeth. Dyes of yellow and red shades are obtained from the roots.

The various parts of the plants are valued for their medicinal properties not only in India and Pakistan, but also in other Eastern countries.

214. RANDIA DUMETORUM LAMK.

Syn. Randia spinosa (Thumb.) Poir.

Family: *Rubiaceae*

Local Names: Ghela, maineal, mainphal.

Description: A large, deciduous shrub, armed with stout, axillary spines, 1-1.5 in. long; bark grey. Leaves usually clustered on the suppressed branches, obovate or strap-shaped, 1-2.5 in. long, thin, glabrous or hairy. Flowers, white, turning yellow when fading, fragrant, about 1 in. across, solitary or 2-3 together, at the ends of short leaf-bearing branches or on the axillary spines; calyx densely hairy; corolla hairy outside. Fruit yellow, ovoid or globose, smooth or obscurely ribbed, crowned with the persistent calyx lobes, glabrous, 2-celled, fleshy; seeds numerous, embedded in a gelatinous pulp.

Distribution: Very common throughout India and parts of the Punjab in monsoon and dry forest areas.

Uses: The wood is white to light brown, compact and hard; it is used for agricultural implements, fences, walking sticks, combs, and as fuel; it may be suitable for cotton reels and small solid bobbins.

The leathery shell of the fruit contains a saponin, the pulp a glucoside saponin, and the seeds an alkaloid and an essential oil. The pounded fruit is mixed with stored grains in the Konkan to preserve the grain from insect attack. Another property of the fruit is that it intensifies the colour in calico-printing. The ripe fruit after roasting is used as food. The unripe fruit and also the roots are used as fish poisons.

The bark and the fruit have medicinal uses.

215. RHAZYA STRICTA DECAISNE

Family: *Apocynaceae*

Local Names: Hisawarg, sewar, sihar.

Description: A gregarious, glabrous, leafy under-shrub, with few branches. Leaves lanceolate, 2-3 in. long, leathery, yellow when dry. Flowers white, fragrant, in short, many flowered, stalked cymes; stalks pubescent; calyx glabrous, lobes thick, triangular; corolla 0.5 in. long, inflated in the upper half, throat hairy. Follicles cylindric, in pairs; erect, 1.5-3 in. long, glabrous, slightly curved, striate; seeds brown, winged at the extremities.

Distribution : Trans-Indus territory, Salt Range, Peshawar and dry plains of Sind.

Uses : The wood is useful as firewood. The dried fruit is of great importance, being one of the well-known vegetable rennets; in Baluchistan it is commonly used as a coagulant in the making of cheese.

The leaves are bitter, but the bitterness is destroyed by soaking them in water; leaves soaked in water are useful as fodder for goats.

The fruits and leaves are used in indigenous medicine.

216. RHIZOPHORA MUCRONATA LAM.

Family : *Rhizophoraceae*

Local Names : Bhora, kamo, kandal, rai.

English Name : The Mangrove.

Description : A small or moderate-sized, evergreen tree, supported by enormous roots from the stems and branches; branchlets marked with scars of fallen leaves, glabrous, purple. Leaves elliptic, 3-8 in. long, thick, glabrous, bright green above, pale beneath, dotted with minute, dark coloured spots. Flowers in axillary, usually 3-flowered cymes; calyx-lobes pale yellow, thick, glabrous; petals white, oblong, thick, fleshy, hairy within. Fruit 1-2 in. long, dark brown, pendulous, rough, embryo often attaining 30 in. before falling from the tree.

Distribution : Tidal shores and creeks from the Indus to Malabar, the Sunderbans; common along the estuary of the Indus and coasts and back-waters of India generally.

Uses : The young plants are useful as posts for huts and for reinforcing mud walls; the wood is valuable as fuel and for making charcoal.

The bark contains 25 per cent of tannin and is used as a tanning material for leather; it also contains a brown colouring matter used for dyeing leather brown. The bark tanned leather has a smell characteristic of the mangrove bark extract. The bark is also used for toughening fishing lines and ropes. An excellent salmon colour dye is extracted from the bark.

The fruit is sweet and edible; a light wine is made from the juice by fermentation.

From the aerial roots salt is occasionally extracted.

217. RHUS COTINUS LINN.

Family: *Anacardiaceae*

Local Names: Ami, bauru, bhan, chaniat, latga, paan, tunga.

English Names: Indian Sumach, Wig Tree.

Description: A deciduous shrub or small tree; branchlets, leaf-stalks, and underside of leaves covered with soft pubescence. Leaves strongly aromatic, 2-4 in. long, entire, elliptic or obovate, long-stalked. Flowers pale purple, in large hairy panicles 3-6 in. long; fertile flowers few; stalks of sterile flowers elongate after flowering, densely covered with long silky hairs. Drupes hairy, 1-seeded, obliquely ovate, 0.25 in. long, unequally lobed.

Distribution: The Western Himalayas, Tehri-Garhwal, Kumaon at 3,000-7,000 ft.

Uses: The wood is dark yellow and mottled; in Europe it is known as "Young Fustic"; it is used for making beautiful picture frames and inlaid cabinet work; it is also used for dyeing woollen and silk fabrics, and for tanning. The twigs are used in making baskets.

The leaves contain 18-22 per cent of tannin. The powder of dried leaves, leaf-stalks and young branches of this tree and the allied species *R. coriaria* ("mutchli," "tatrak") is the "sumach" of commerce, and contains tannin and a yellow dye; it is in demand for tanning light coloured leather; depending on the mordant used sumach gives a yellow, grey, brownish-yellow, or black colour in calico-printing.

218. RHUS SUCCEDANEA LINN.

Family: *Anacardiaceae*

Local Names: Kakra-singi, lakhar, tatri.

English Name: Wild Varnish Tree.

Description: A middle-sized or small, deciduous tree, almost the whole of the tree is glabrous. Leaves glabrous, odd-pinnate 6-12 in. long; leaflets 7-13 pairs, entire, shining, ovate-lanceolate, blade 3-6 in. long. Flowers green-yellow in lax, drooping panicles, ramifications slender, at times covered with minute hairs. Drupes globose, 0.25 in. diam., glabrous, yellow or light brown; seeds hard, embedded in a pulp containing vegetable wax mixed with fibres.

Distribution : The Himalayas from the Jhelum eastwards, 2,000-8,000 ft., Khasi Hills.

Uses: The tree is useful because of the good, natural lacquer obtained from it, and because of the natural wax contained in the fruit, which is much used for making candles and Japanese lacquer-work. The bark contains 10 per cent of tannin. The juice from the tree blisters the skin and stains paper black.

Galls made by insects on the tree are of medicinal value.

219. RHUS WALLICHII HOOK F.

Family: *Anacardiaceae*

Local Names : Akoria, arkhar, arkhoi, arkol, kambal.

Description : A small or middle-sized, deciduous tree; bark smooth, grey; all parts rusty tomentose. Leaves approximately near the ends of branches, 12-18 in. long, odd-pinnate; leaflets 7-11 pairs, entire, 3-9 in. long. Flowers almost without stalks, in axillary panicles; petals greenish-yellow with dark veins. Drupes 0.3 in. in diam. in compact pyramidal panicles, hairy when young, glabrous when ripe; rind dry, papery; seeds hard, smooth, embedded in a mass of vegetable pulp.

Distribution : North-West Himalayas, Kashmir to Nepal, 2,000-7,000 ft. in hot, dry localities.

Uses : The wood is reddish-brown, yellow when dry; it is used for saw-frames, axe-handles, and musical instruments.

The milky juice from the bark colours paper black and blisters the skin.

In China and Japan a varnish is made out of the juice tapped from the tree. In Japan the wax contained in the fruit is used for making candles.

220. RICINUS COMMUNIS LINN.

Family: *Euphorbiaceae*

Local Names : Arand, arandi, ind.

English Names : Castor Oil Plant, Palma Christi.

Description : A tall, evergreen, glabrous shrub, annual or perennial. Leaves deeply palmately lobed, about 1 ft. in diam. Flowers unisexual, male and female on the same plant in terminal racemes; female flowers above the male; petals absent; male calyx 3-5 valved, stamens numerous; female calyx spathaceous, styles red or yellow. Capsules 3-seeded, 0.5-1 in. long, globosely oblong, generally, softly spiny; seeds generally mottled grey with brown-purple streaks.

Distribution : Originally a native of America or Africa, but extensively cultivated and now run wild all over India and Pakistan.

Uses : This is one of the most valuable oil-seed bearing plants. In addition to the high percentage of oil contained in the seed, it also contains "ricin," a blood-coagulating toxin, and the enzyme lipase. The oil is highly valuable both medicinally and industrially; it does not solidify at low temperatures and retains its viscosity at high temperatures; it is a non-drying oil with an iodine value of 82-90; it is therefore largely employed as a lubricant; it is especially of great value for aero engines and is an important constituent of hydraulic fluids; it is also largely used for making candles, soaps, hair oils, pomades, perfumery, ointments, fly poisons, fly papers, typewriting inks, cutting oils, artificial leather and linoleum, in the manufacture of rubber substitutes, and as a luminant and wood oil.

In Baroda "roghan" is made from castor oil and not from "poli" (*Carthamus oxycanthus*), as in Peshawar, for the manufacture of wax-cloth.

The oil is also utilized in the manufacture of Turkey red oil, which is used in dyeing and printing of cotton and woollen fabrics, and as an aid in the finishing of cotton, linen, silk, and leather. Arandi oil serves as a fixing agent for alizarine dyes, as an auxiliary in some dyeing preprations, such as in dyeing with "al" (*Morinda tinctoria*), and as one of the best dressing agents for tanned hides and skins to make them soft and pliable.

The hydrogenated oil is used in the preparation of splitting agents, in calico-printing and technical wax preparations.

The oil cake is a valuable manure.

The leaves are used as a lactagogue; they are fed to milch cattle. They are also fed to eri-silk worms.

The dry stems and husks of capsules are used as fuel.

The plant has many medicinal uses.

221. RUBIA CORDIFOLIA LINN.

Family: *Rubiaceae*

Local Names: Madar, manjit.

English Name: Indian Madder.

Description: A climbing herb; root-stock perennial; stem and branches 4-angled, angles minutely prickly. Leaves in whorls of 4, cordate-ovate, 2-4 in. long, nerves and margins prickly. Flowers small dark red, in numerous small cymes forming large panicles; calyx-tube globose. Fruit succulent, globose or slightly 2-lobed, black, juice red, 2-seeded.

Distribution: Throughout the hilly districts of India and Pakistan, common in the Himalayas up to 8,000 ft.

Uses: The plant is of commercial importance because of the valuable dye present in its roots and lower twigs; the pigment contained in the red mass between the outer skin and the wood of the root is not only of a superior quality, but is also much greater in quantity than in any other part of the plant. It is in the form of a glucoside and is a mixture of two colouring principles, alizarine and purpurin. Manjit or madar is a beautiful fast red dye. In the past this pigment was used for Turkey red dyeing of wool, cotton and linen, but now it has been displaced by synthetic dyes. At present it meets the requirements of artists for a vegetable pigment of superior quality.

It is claimed that there are two varieties of this dye yielding shrub, viz., " manjit " and " khasiana "; the former does not contain alizarine, the colouring principle being a mixture of purpurin and an orange dye, " munjistin." This variety is greatly favoured in calico-printing. " Khasiana " is richer in the colouring principle and is used for dyeing coarse cotton cloth.

Madar is largely used for colouring medicinal oils; it has many medicinal uses.

222. SACCHARUM MUNJA ROXB.

Family: *Gramineae*

Local Names: Munj, sarkhand, sarr, sentha, sirki.

Description: A very tall, erect grass growing in clumps; stems up to 18 ft. high, pale, solid, smooth, very leafy at the base. Upper leaves up to 2.5 ft. long, lower up to 6 ft. long; leaves sea-green in colour, rough on the margins, with dense hairs at the junction of the leaf-sheath and the blade; leaf-sheaths silky at the base, otherwise glabrous, smooth, straw coloured. Flowers in feathery panicles, 1-3 ft. long, lanceolate, pale cream to dark reddish-purple in colour, branches whorled.

Distribution: Common in Northern India and Pakistan.

Uses: This is a useful grass; in Jeypur it is planted as a sand binder; its leaves and stems are used in many ways; the fibre, commonly known as " munj," is extracted from the leaves and stems; ropes are made out of this fibre and are used for making baskets and mats, and in rigging boats; the leaves, known as " sarr," not being affected by fresh water, are twisted together to make ropes for towing boats, for Persian wheels and for tying up cattle; the leaves are used for making paper and for thatching houses.

The lower parts of the stem are stronger than the upper parts; they are known as " sentha " or " kana," and are made into chairs, stools, tables, baskets, screens and linings for walls; the upper halves of the stems are known as " sirki," and are used for thatching house-boats, carts, etc.

The young grass can be used as fodder.

223. SACCHARUM SPONTANEUM LINN.

Family: *Gramineae*

Local Names: Bagberi, dharbi, kans, kash, khau, khus.

English Name: Thatch Grass.

Description: A very variable, perennial grass, with thick rhizomes; stems 5-20 ft. high, erect, solid above, hollow below, having several nodes, smooth, polished, densely waxy below the nodes, slender, with silky hairs below the flower heads. Leaves erect, up to 5 ft. long, very narrow; leaf-sheaths longer than the internodes, often with reddish or purplish blotches, glabrous or with scattered hairs. Inflorescence an arrow-shaped panicle, silvery, dense, slender.

Distribution : Sind, the Punjab, and throughout the warmer parts of India and Pakistan.

Uses : This reed-like grass is very valuable in many ways. It is an excellent fixing agent for shifting sand and unstable soil. The leaves provide a very good material for thatching and for making mats, screens and brooms. The fibre extracted from the reed is extensively used for platting, and cordage; the ropes made out of this fibre are so strong that they are used for Persian wheels, towing lines, etc. The reed is useful for making paper pulp. Wherever this reed grows it provides very good fodder for buffaloes.

224. SALIX TETRASPERMA ROXB.

Family : *Salicaceae*

Local Names : Bains, bed, bent, bins, jalmala.

English Name : Indian Willow Tree.

Description : A small deciduous tree, very variable; bark rough with deep vertical fissures; young parts at first white silky hairy, later becoming glabrous. Leaves lanceolate or ovate-lanceolate, 2-6 in. long, silky when young, lower surface covered with a white or pale bloom, minutely serrate, bright green, glabrous above. Catkins hairy, drooping; male catkins sweet scented, 2-3 in. long; female catkins 3-4 in. long. Fruiting catkins up to 5 in. long; capsules glabrous, often in groups of 3 or 4, long stalked, entire, 4-6-seeded.

Distribution : Nearly throughout Tropical and Sub-Tropical India and Pakistan, on river banks and moist places; and on the hills of southern India up to 7,000 ft.

Uses : The wood is light red or reddish-brown, soft and porous; it is used for posts, planks, well construction, cabinet and fancy work, furniture, gun-powder charcoal and firewood; in Madras it is much used for making pencils. The wood has been found suitable for the match industry; it is considered that it may be suitable also for making cricket equipment and bent-wood furniture.

The young shoots and branches are woven into baskets and wicker-work. The bark is used as a tanning material, and as a febrifuge. The leaves supply good fodder.

225. SALMALIA MALABARICA (DC.) SCHOTT. & ENDL.

Syn. Bombax malabaricum DC.

Family: *Bombaceae*

Local Names: Semal, semur, shewa.

English Names: Cotton Wood Tree, Semal Tree, Silk-cotton Tree.

Description: A tall, upright, deciduous tree, having large buttresses at the base and whorled branches spreading horizontally; young shoots and branches covered with sharp, conical prickles; bark silvery-grey and smooth. Leaves digitate; leaflets 5-7, short-stalked, glabrous, entire, 4-8 in. long. Flowers in the axils of fallen leaves, large, scarlet, sometimes white; calyx cup-shaped, thick, leathery, white silky within; petals 2-3 in. long, oblong, tomentose outside, pubescent or glabrous within. Stamens numerous, in 6 bundles. Capsules ovoid, short-stalked, velvety, hard, woody, 4-5 in. long, black when ripe, splitting in 5 segments; seeds numerous, glabrous, embedded in abundance of white, silky wool.

Distribution: Throughout India and Pakistan from the Indus eastwards and southwards up to 3,000 ft. elevation.

Uses: The wood is yellowish or pinkish white or creamy white when freshly cut, but later turns dark; it is soft, light and perishable. It is one of the commonly used and best woods for match boxes and match splints. It is also extensively used for packing cases, tea and rubber chests, toys, three-ply scabbards, lining of wells, second-grade pencils, oil casks, planking, cheap furniture, oar blades, and box veneers. The trunks are hollowed out for making coffins, drums, dug-outs and water-pipes. It is also used for making fishing floats and rafts for heavier timber to make it float. The wood is very suitable for brush handles, and for piles completely immersed in fresh water. Fine shavings of the wood, "wood wool," are valuable as a packing material.

The floss from pods is the silk cotton of commerce; it is light, elastic and impermeable to moisture; in buoyancy it is superior to "kapok" (*Ceiba pentandra*); like kapok it is very suitable for stuffing life-belts, mattresses, upholstery and wadded cloth quilts, for making surgical dressings, as an insulating material for refrigerators, and as a packing material for fragile goods.

The oil from the seed can be used as a luminant, for soap making, and for other purposes for which cotton seed oil can be used. The oil cake is very nutritious.

From the stem exudes a gum, known as "mocharas"; it contains tannins of the catechol and mixed types. In Assam, a cement is made by mixing this gum with ashes and castor oil for caulking iron sugar-boiling pans.

The leaves and flowers are eaten by cattle; the seeds make a nourishing cattle food; the immature calyx is the vegetable known as "semargulla" in Uttar Pradesh (the United Provinces).

The gum (mocharas), roots of young plants ("musli" or "semal musla"), and the bark have many uses in indigenous medicine.

226. SANSEVIERIA ROXBURGHIANA SCHULT. F.

Syn. Sensevieria zeylanica Willd.

Family: *Liliaceae*

Local Names: Manjinaru, marool, murva, saga.

English Name: Bow-string Hemp.

Description: Root-stock creeping, yellowish white, very long; 20-30 plants in a single clump. Leaves 5-12 to a growth, recurved a little above the middle, erect, ascending; the outer 2-5 ft. long, lanceolate, more or less flat; the inner larger and thicker than the outer; all leaves ending in a sharp, brown spine, sheathing at the base, both surfaces slightly shining, gland dotted, smooth, with transverse bands of light and dark green, furrowed on the back. Flower bearing stalk 13-23 in. high, arising from the centre of the plant within the leaves, fleshy, colourless at the base, green with reddish-green spots above; flowers on a minute swelling, in clusters of 6, pale greenish-white, slightly scented. Fruit a berry.

Distribution: Bengal and Peninsular India.

Uses: The plant yields a valuable fibre, known as " murree " or " murva "; it resembles pine apple fibre and is soft, silky, very elastic and pliant. Murva has a variety of uses; it is particularly prized for bow-strings; it is also used for making ropes, twine, thread, cordage and matting, and can be woven into fine cloth which can be readily dyed. Murva ropes are used in deep sea dredging.

The leaves are very useful for paper making.

227. SANTALUM ALBUM LINN.

Family: *Santalaceae*

Local Names: Chandal, chandan, gandala, safed chandan, sandal, sukhad.

English Name: Sandalwood Tree.

Description: A moderate-sized, glabrous, ever-green tree, partly parasitic on roots of other plants, branches slender, drooping; bark dark coloured, rough with short, verticle cracks. Leaves opposite, ovate or elliptic-lanceolate, 1.5-2.5 in. long, thin, glabrous, shining above, pale beneath. Flowers brownish-purple, in small panicles; perianth bell-shaped. Drupes globose, 0.25 in. diam., purple black, succulent; seeds bony, rough.

Distribution: Indigenous in Peninsular India from Nasik and Northern Cirčars southwards.

Uses: The wood is yellowish-brown to dark brown, hard and highly scented. The most valuable part of the wood is its inner part, the heart wood; the outer part or the sap wood is not of any value except as firewood; it contains no essential oil, and is non-odorous. The heart wood is resistant to attacks by white ants. From it an essential oil is distilled and also from the roots, which is very largely used in perfumery, toilet preparations, and scenting inferior woods; the oil is also useful as an insecticide and an insect repellent, and therefore the wood is valuable for making insect-proof chests and boxes; small chips of the heart wood are kept in the folds of clothes to protect them against insects and to impart to them their fragrance. In parts of Bombay, Madras, and Mysore States ornamental carving of sandalwood is an important industry; the wood is very much used for cabinet work, boxes, furniture, fancy articles, combs, picture frames, coffins, and is burnt as incense. The saw-dust of the heart wood is made into scented cakes and sticks to be burnt as incense; and is used for stuffing sachets to perfume clothes. A paste of the wood made with water is used for making caste marks by Hindus.

The bark occasionally serves as a substitute for areca nuts to be chewed with pan leaves in some villages of Mysore.

The oil obtained from the seed is not of much value; the poor people use it as a luminant.

The essential oil from the wood has medicinal uses.

228. SAPINDUS TRIFOLIATUS LINN.

Syn. S. laurifolius Vahl.

Family: *Sapindaceae*

Local Names: Areeta, bara ritha, ritha.

English Name: Soap-nut Tree.

Description: A large, deciduous tree; bark grey with rough scales. Leaves alternate, 5-12 in. long, leaflets 2-3 pairs, elliptic, glabrous or pubescent beneath, blade 1.5-8 in. long. Flowers in terminal, rusty pubescent panicles, unisexual and bisexual flowers on the same plant, white, hairy. Fruit fleshy, rusty tomentose, later glabrous, saponaceous.

Distribution: Common in the evergreen forests of the Konkan and Kanara, along the Western Ghats and Southern India; also found in other parts of India and Pakistan.

Uses: The wood is yellow, hard and strong; it is useful for building purposes, carts, and oil mills.

The tree is best known for its fruits which are extensively used as a substitute for soap in washing silk and woollen fabrics. The root bark contains saponin and so is used much in the same way as the fruit. The fruit and the root bark are used as a fish poison.

The seed yields a semi-solid oil.

The fruit has many uses in indigenous medicine.

229. SAUSSUREA LAPPA CLARKE

Family: *Compositae*

Local Names: Kot, kust, kuth, pachuk.

English Name: The Costus.

Description: A small, stout, herbaceous plant; stem 6-7 ft. high, robust, upper parts pubescent; leaves rough above, glabrate beneath, irregularly toothed, 6-12 in. long with the stalk. Flower heads sub-globose, 1-1.5 in. diam., without stalks, in clusters of 2-5, very hard; bracts surrounding the heads numerous, purple; corolla dark purple, 0.75 in. long. Fruit 0.25 in. long, curved, compressed, tip narrowed, brown.

Distribution: Indigenous in Kashmir 8,000-12,000 ft., and Hazara.

Uses: The valuable part of the plant is the root, " pachuk " of commerce; it is regarded as the " costus " of the ancients, and so is often known as " costus root." It contains an essential oil, the alkaloid saussurine, etc. In India and Pakistan pachuk is used in perfumery, especially for the hair, but its chief use is medicinal; in Europe it is used in the preparation of rich perfumes; and in China and Japan it is burnt as an incense. It is also useful as an insecticide and insect repellent; the roots are placed in folds of shawls and woollen clothes to serve a double purpose, to protect them from insects and to impart to them their characteristic perfume. Pachuk is reputed not to tarnish gold braids and embroidery on woollen clothes when placed in contact with them.

230. SCHLEICHERA OLEOSA (LOUR.) MERR.

Syn. S. trijuga Willd.

Family: *Sapindaceae*

Local Names: Gosum, kusum.

English Names: Ceylon Oak, Honey Tree, Kosumba, Lac Tree.

Description: A large deciduous tree; trunk fluted, thick; bark smooth, grey; young shoots silky. Leaves even-pinnate; leaflets opposite, without stalks, 2-3 pairs, membranous when young, leathery when old, elliptic, entire, sometimes hairy on the nerve beneath, lowest pair much smaller than the terminal pair. Flowers minute, yellowish-green, crowded together on 2-6 in. long cymes, unisexual and bisexual, petals absent. Fruit ellipsoid, spinous or smooth, 0.75 in. long; seeds 1 or 2, enclosed in a fleshy, edible covering.

Distribution : From the North-West Himalayas to Central and Southern India.

Uses : The wood is strong, durable, red, heavy and hard; it is in greater demand for making oil and sugarcane mills than any other wood; it is also much valued for making carts, agricultural implements. rice-pounders, mortars, tool handles, and for turnery; it is also useful as firewood and makes excellent charcoal.

The kusum oil of commerce is the yellowish-brown oil extracted from the seeds; it is not only much used for lighting and cooking, but is also reputed to be the basis of Macassar hair oil and is widely used as a hair oil; it is also used for soap making, and in parts of southern India for anointing the body. The pulp round the seed is edible. The powdered seeds are applied to remove maggots from ulcers and wounds in animals.

A dye is extracted from the flowers. The bark contains 9 per cent of tannin. The leaves and twigs are lopped for fodder.

The tree is one of the best hosts for the culture of lac insects.

231. SEMECARPUS ANACARDIUM LINN. F.

Family: *Anacardiaceae*

Local Names : Bhela, bhilawan, bhilwa, geru.

English Name : Marking Nut Tree.

Description : A medium-sized tree; bark rough, dark coloured, exfoliating in irregular patches; young parts harsh tomentose. Leaves crowded at the ends of branches, 7-24 in. long, obovate-oblong, leathery, shining above, white or buff tomentose or glabrous beneath. Flowers almost without stalks, greenish-yellow, unisexual, crowded together, arranged in erect, branched, terminal panicles. Fruit a drupe, 1 in. long, ovoid or oblong, smooth, shining black, flesh orange coloured, seated on the yellow, enlarged stalk.

Distribution: Sub-Himalayan tract up to 3,500 ft., Assam, Khasi Hills, Chittagong, Madhya Bharat (Central India), and the Western Peninsula.

Uses: The useful part of the tree is its fruit. The caustic juice contained in the rind has many medicinal, domestic, and industrial uses. It is a powerful irritant and vesicant, and causes dermatitis; advantage of these properties is taken by malingerers to produce ophthalmia and skin irritations. The juice is used for marking linen indelibly. It has recently been shown that this juice can be converted into non-vesicant products, which can be commercially used for making lacquers, varnishes, enamels, semi-synthetic tanning materials, insulating materials and moulding plastics; these non-vesicant products in combination with rubber waste can be made into hard, semi-hard and soft rubber goods.

The seeds also yield an oil which is used as a preservative against attacks of white ants and as a lubricant for wooden axles of carts.

The juice extracted from the trunk is also a powerful irritant and vesicant and can be converted into a varnish.

The seeds and the enlarged yellow fruit stalk are edible.

232. SHOREA ROBUSTA GAERTN. F.

Family: *Dipterocarpaceae*

Local Names: Sal, salwa.

English Name: Sal Tree.

Description: A large gregarious tree. Leaves when full grown glabrous, shining, 4-10 in. long, broad ovate. Flowers yellowish, on short stalks, in racemes, arranged in large, branched panicles; calyx and petals softly grey tomentose outside, petals orange inside.

Distribution: In the north in the Sub-Himalayan tract from the Kangra Valley in the Punjab to Assam; in the south from the Coromandel Coast west to Pachmarhi Hills and south to the Godaveri River.

Uses: The wood is dark reddish-brown, hard, coarse and very durable; it is the best known and most used timber in Central and East India. In India and Pakistan it ranks second to teak (*Tectona grandis*); it is resistant to attacks of white ants and is in great demand for pit-props in coal mines, bridge construction, railway sleepers, piles, well construction, dugout canoes, boat building, masts, spars and oars; the wood is also used for furniture, tent poles and pegs, oil mills, dyeing vats, carriages, spokes, felloes and hubs of wheels, carts, solid cart wheels, ploughs, rice pounders, railway turn tables, brake blocks, picking arms in textile mills, and coopers' work; it makes very good charcoal which is highly valued by local blacksmiths.

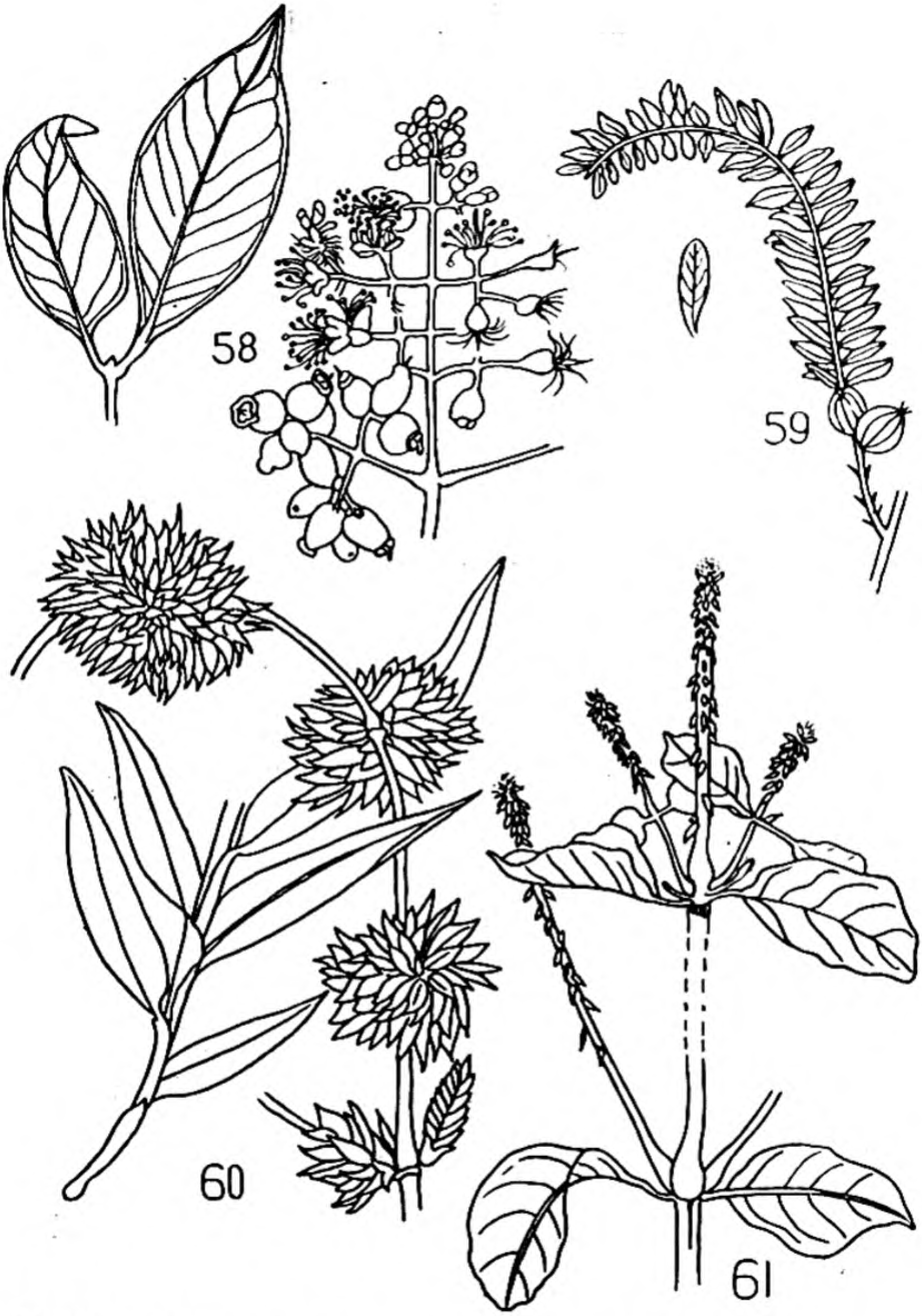
Large quantities of bark are collected where the trees are felled as it is extensively used locally as a tanning material, the tannin content being 9 per cent; leather tanned with this bark is harsh and dark reddish coloured. A red and black dye is extracted from the bark.

An aromatic oleo-resinous gum exudes from the stem; it is the "sal dammar" of commerce, but locally it is known as "ral" or "dhooma"; it finds extensive use in marine yards for caulking boats, for hardening soft waxes used in the manufacture of shoe polishes, carbon papers, typewriter ribbons, etc., and in the manufacture of inferior qualities of paints and varnishes. All over India and Pakistan this gum is burnt as an incense and as a disinfectant fumigant; it is one of the important ingredients required for the performance of cremation ceremonies by Hindus.

Sal dammar on distillation gives "chua" oil which is employed in the manufacture of attars and incenses. This oleo-resin is also used for making ointments for skin diseases. The Santals use this gum for plugging holes in their earthen and metal vessels.

The well-known "sal butter" is extracted from the seeds; it is used as a luminant, an adulterant for ghee, a substitute for cocoa butter in the manufacture of chocolates, and a cooking agent.

The leaves are made into plates and covers for home-made cigars by the aboriginals of Central India.



58, Syzygium Cumini. **59,** Emblica officinalis.
60, Dendrocalamus strictus. **61,** Achyranthes aspera.

233. SKIMMIA LAUREOLA SIEB. & ZUCC. EX WALP.

Family: *Rutaceae*

Local Names: Nair, ner.

Description: A glabrous, aromatic, evergreen shrub, 3-8 ft. high. Leaves 3-6 in. long, alternate, oblong-lanceolate, entire, gland-dotted, crowded near the ends of branches. Flowers 0.5 in. diam., yellow or white, uni- or bisexual, in crowded, erect terminal panicles, 1.5-2 in. long. Calyx 5-lobed, persistent. Drupes ovoid, 0.5-0.75 in. long. red, fleshy, 1-3-seeded.

Distribution: Temperate regions of the north-western Himalayas from Kashmir to Kumaon, 6,000-10,000 ft., Khasi Hills, 5,000-6,000 ft.

Uses: The leaves and the freshly cut wood are strongly aromatic; from the leaves is extracted an essential oil, which may be used in perfuming soap and as a substitute for petitgrain oil. In Kashmir the leaves are used as incense.

234. SOYMIDA FEBRIFUGA ADR. JUSS.

Family: *Meliaceae*

Local Names: Lal chandan, rankat rohan, rohan, soymida.

English Names: Bastard Red Cedar, Indian Red Wood, Rohun Tree.

Description: A medium-sized or large, glabrous tree; bark dark, rough, exfoliating in large patches or scales. Leaves even pinnate 9-12 in. long; leaf-stalk with a thickened base, leaflets 3-6 pairs, 2-4 in. long, glabrous, pale, elliptic. Flowers in large panicles, bisexual, minute, greenish-white. Capsules smooth, black when ripe, 1-2 in. long, 5-celled, 5-valved; seeds numerous, winged at both ends.

Distribution: Western Peninsula, Madhya Pradesh (the United Provinces), and Madhya Bharat (Central India).

Uses: The wood is dark red-brown, hard, durable, strong, takes a good polish, and has silvery grains; it is not readily attacked by white ants; it resists the action of water; it is used for building purposes, agricultural implements, cattle troughs, oil mills, well construction; it makes beautiful furniture and is well suited for carving and turnery.

The bark is bitter; it contains 13-14 per cent of tannin, and is used for tanning and dyeing; it gives a dirty brown colour to cotton fabrics; a red fibre is extracted from the bark which is used for making ropes.

From the bark exudes a clear gum, which makes a good adhesive mucilage.

The bitter bark is used as a febrifuge in indigenous medicine.

235. STERCULIA FOETIDA LINN.

Family: *Sterculiaceae*

Local Names: Jungli-badam, ran badam.

English Name: Bastard Poon Tree.

Description: A large, deciduous tree. Leaves digitate; leaflets 7-9, elliptic-lanceolate, glabrous when full grown, about 6 in. long. Flowers unisexual, male and female flowers on separate trees, dull red, foetid, in panicles 6-8 in. long; calyx hairy within, glabrous outside. Follicles large, woody, boat-shaped, fibrous within; seeds numerous, black and smooth.

Distribution: Common in South India.

Uses: Every part of the tree when wounded is foul smelling. The wood is light yellow, tough and lasting; it is used for packing cases and turning, and for making masts known as "poon-spars," canoes, and small handsome articles.

The bark yields rope fibres.

The seeds are edible; a bland, light yellow, non-drying oil is extracted from the seeds; it is non-toxic and is often used as a purgative in place of olive oil.

236. STERCULIA URENS ROXB.

Family: *Sterculiaceae*

Local Names: Gulu, karai, kulu, pandruk, tabsi.

Description: A middle-sized, deciduous tree; bark white, smooth, shining, greenish-white, exfoliating in large, irregular, papery plates. Leaves at ends of branches, palmately 5-lobed, lobes entire, tomentose beneath, cordate, 8-12 in. long. Flowers yellow, unisexual and bisexual, in crowded, erect panicles, covered with a glandular pubescence. Fruit of 4-5, ovoid, thickly leathery, red carpels, covered with stiff, stinging bristles; seeds 3-6 in. each carpel, dark brown.

Distribution · Tropical Himalayas from the Ganges eastwards and Southern India.

Uses : The wood is very soft, reddish-brown, with a foetid smell when first exposed; it is used for toys, musical instruments, doors for huts, dugout canoes, boat planking, inferior packing cases, carving, models, platters, etc.

The bark yields a useful fibre, suitable for making ropes and coarse cloth; this cloth was made into garments in the past, especially in the north. The bark exudes a white gum, known as " katila " or " karaya " gum, used as a substitute for the imported tragacanth of the British Pharmacopœia, the true tragacanth being a product of ***Astragalus gummifer;*** " karaya " gum of good quality is in many respects similar to tragacanth, and superior to it in some qualities, e.g., viscosity; it is used in the manufacture of glycerine toilet creams and cosmetics, for thickening ice-creams, for emulsifying volatile oils, and as a binding agent in the making of pills.

The seeds are edible.

The gum is used in indigenous medicine.

237. STERCULIA VILLOSA ROXB.

Family: *Sterculiaceae*

Local Names : Udal, vakenar.

Description : A small or middle-sized, deciduous tree; bark grey-brown, smooth, covered with corky warts. Leaves crowded at the ends of branches, oblong or ovate-oblong, palmately deeply 5-7-lobed; lobes entire or sub-lobate, tomentose beneath, glabrous above, 12-18 in. across. Flowers unisexual and bisexual, 0.6 in. diam., stalked, yellow, in drooping, terminal, rusty-pubescent panicles. Follicles 2-7, without stalks, leathery, rough, bright red when ripe, tomentose within and without, 1.5-3 in. long; seeds black; shining, many.

Distribution : Common in forests throughout India and Pakistan; Sub-Himalayan tract from the Indus eastwards.

Uses : The wood is greyish-brown, soft, light and fibrous, but not very useful; in Assam and the Duars it is used for tea chests; it makes good match splints.

The important part of the tree is the strong whitish-pink, coarse fibre obtained from the bark; the fibre is used for making elephant harness, drag ropes, ropes for tying rafts, coarse canvas for bags, etc. In the past the fibre was also used for making paper. A pellucid gum is obtained from the bark when wounded; it serves as a poor substitute for the true tragacanth gum.

238. STREBLUS ASPER LOUR.

Syn. Epicarpus orientalis Blume

Family: *Urticaceae*

Local Names: Karwati, rusa, siora.

Description: A small, rigid, scraggy, evergreen tree; bark grey, soft, irregularly ribbed; branchlets pubescent or tomentose. Leaves ovate, obovate or rhomboid, 1-3 in. long, irregularly toothed. Flowers unisexual, male and female flowers on separate individuals; male flowers in stalked, globose heads; female flowers on slender stalks thickened at the top, axillary, solitary or clustered. Berries yellow, 1-seeded, loosely enclosed in the enlarged, peristent perianth.

Distribution: Sub-Himalayan tract from the Beas eastwards, Bengal, Madhya Bharat (Central India), and the Peninsula.

Uses: The wood is grey, moderately hard and takes a beautiful polish; it is used for making small articles and cart wheels; it is very useful as firewood; in Burma it is used as one of the combustible ingredients of the thick Burmese cheroots. In Siam and some parts of India the bark is used for making paper. The juice from the stem is used like rennet to curdle milk. The twigs are used as baits for catching prawns in Malaya.

The leaves after having been steeped in water are used in the same way as sand paper to polish wood, ivory, and horn.

The fruit is edible.

239. STRYCHNOS NUX-VOMICA LINN.

Family: *Loganiaceae*

Local Names: Kajra, kuchala.

English Names: Nux-vomica Tree, Poison Nut Tree, Snakewood, Strychnine Tree.

Description: A medium-sized or large, evergreen or deciduous tree; bark smooth, greyish and thin; branchlets opposite, glabrous, channelled, compressed and dilated at the nodes, often converted into strong, woody spines. Leaves opposite, broadly elliptic, 2-5 in. long, shining, thin, glabrous. Flowers greenish-white, in short, terminal, downy cymes. Fruit globose, 1-2 in. diam., slightly rough but shining, yellow to orange-red when ripe; seeds immersed in a white pulp, covered with silky hairs.

Distribution: Abundant in the Konkan and Kanara, throughout the Bombay State; very common on the west coast of Madras; Bengal, parts of Uttar Pradesh (the United Provinces), and Orissa.

Uses: The wood is white when freshly cut, ageing to yellowish-grey, hard, durable and not attacked by white ants; it is used for cheap buildings, furniture, ploughs, cart wheels, fancy cabinet work, axe handles, hammer shafts, clod crushers.

Commercially the most important part of the tree is the seed which is the source of the valuable alkaloids, strychnine and brucine. The seeds are highly poisonous to man and most animals, but are eaten by langurs and some birds. Besides the alkaloids the seed also yields an oil and a dye which produces a brown colour on cotton fabrics; the seed is also used in the distillation of country spirits to make them more potent. The seed and the leaves serve as fish poisons.

All parts of the plant except the pulp of the fruit are poisonous. The pulp is eaten by birds, cattle, monkeys and also by man.

The bark, the leaves and the fruit are of medicinal value.

240. STRYCHNOS POTATORUM LINN. F.

Family: *Loganiaceae*

Local Names: Neimal, nirmali.

English Name: Clearing-nut Tree.

Description: A small or medium-sized, glabrous, deciduous tree; trunk often fluted; bark dark coloured, deeply furrowed; branchlets opposite, twigs swollen at the nodes. Leaves elliptic-lanceolate, 2 3 in. long. Flowers white, fragrant, in many flowered, axillary cymes; corolla tube hairy at the mouth. Berries globose, 0.5-0.75 in. diam., black when ripe; seeds 1-2, pale yellow, covered with short, silvery hairs.

Distribution: Throughout the Peninsula, Bengal, Madhya Pradesh (the Central Provinces), and Utkal (Orissa).

Uses: The wood is at first white, turning to yellow on exposure, hard; it is used for many economical purposes, for posts and rafters in cheap houses, axe handles, ploughs, cart shafts and wheels, agricultural implements, and as fuel.

The seeds are non-poisonous and are used as an emetic; when ground they have the property of clearing muddy water in wells. The pulp of the fruit is edible.

241. SYMPLOCOS SUMUNTIA BUCH.-HAM.

Family: *Symplocaceae*

Local Names: Lodh, pathani-lodh.

English Name: Lodh or Lode Tree.

Description: A small tree; branchlets glabrous. Leaves leathery, elliptic-lanceolate, blade 3-5 in. long, glabrous, crenulate. Flowers in racemes 1.5-4 in. long, more or less hairy, bracts covered with long hairs, enveloping the buds, soon falling off. Fruit ovoid, 0.5 in. long, smooth.

Distribution: Wild in Nepal. Sikkim, Bhutan, Assam, and Khasi Hills, up to 3,000-7,000 ft.

Uses: The tree is useful because of the yellow dye it contains in its bark and leaves. The dye is extracted with hot water.

When the bark is boiled with " sajji matti " (crude carbonate of soda) a red dye is obtained, which is used for printing red on white. The bark and the leaves are chiefly used as a mordant to al (*Morinda tinctoria*), sappan wood (*Caesalpinia sappan*), kamela (*Mallotus philippinensis*), madar (*Rubia cordifolia*) and lac; with kamela a fast yellow colour is obtained. The bark is also used as a mordant in dyeing leather and in calico-printing.

242. SYZYGIUM CUMINI (LINN.) SKEELS.

Syn. Eugenia jambolana Lamk.

Family: *Myrtaceae*

Local Names: Jam, jaman, jambul, kala jam, phalani, phalinda.

English Names: Black Plum, Indian Blackberry, Jambol, Java Plum.

Description: A large, glabrous, evergreen tree; bark thick, smooth, light grey, exfoliating in thick, irregular scales. Leaves opposite, elliptic, smooth, leathery, aromatic, shining, variable in size. Flowers without stalks, whitish or pale green, scented, crowded in small heads at ends of lax, panicled cymes; calyx tube yellow within, rough outside; petals 4, rounded; stamens numerous. Berries juicy, pink when ripening, black when ripe, ovoid, oblong or globose, crowned calyx lobes, 1-seeded.

Distribution: Indigenous to the Western Ghats; throughout India and Pakistan, but not in the arid regions of Sind and Southern Punjab.

Uses: The wood is pale reddish-grey to brownish-grey, moderately hard, tough, fairly durable even under water, takes a good polish; it is considered to be resistant to white ant attacks; it is extensively used for house building, posts, beams, cart shafts, solid cart wheels, yokes, boat building, canoes, oars, masts of boats, agricultural implements, rice mortars, well-curbs, well troughs, steps of wells, carving, turnery and furniture. It also makes excellent firewood.

The bark contains 13-19 per cent of tannin; it is much used for tanning and dyeing, especially in combination with manjit (*Rubia cordifolia*) and goran (*Ceriops roxburghiana*).

The fruit is sweet and astringent; a wine resembling Port in taste and colour is prepared from the fruits in Goa. A spirituous liquor is distilled from the fruit; a vinegar is also manufactured.

The fruit, seed and bark have medicinal uses.

The tree is sacred both to Hindus and Buddhists. It is one of the hosts of tassar silk worms.

243. TAGETES ERECTA WILLD.

Family: *Compositae*

Local Names: Genda, zergul.

English Name: Marigold.

Description: An annual herb, with erect stem and erect branches. Leaves lanceolate, margins hairy and serrate, leaf stalk naked. Flowers solitary, generally yellow coloured.

Distribution: Throughout India and Pakistan; generally cultivated.

Uses: This flowering annual is known for the dye contained in the flowers; the dye is not used by the professional dyer, but it is extensively used in home dyeing, especially by the poor classes for colouring their clothes. The dye produces the shade of yellow known as " egandai " or " gendia "; this dye can be used as a substitute for the dye from " halud "(*Curcuma domestica*),or " harsinghar " (*Nyctanthes Arbor-tristis*) to produce saffron yellow or " champia " shade. Cloth can also be coloured dull green if it is steeped in water containing the dried flowers and alum. Unbleached tassar silk is coloured drab to brownish-yellow and bleached tassar light brownish-yellow with the dye from " genda." Like the annatto (*Bixa orellana*) dye " genda " dye can be used to colour butter and cheese.

244. TAMARINDUS INDICA LINN.

Family: *Leguminosae*

Local Names: Ambli, chinch, imli.

English Name: Tamarind Tree.

Description: A large, handsome, unarmed, glabrous, evergreen tree; bark thick, dark grey, rough, longitudinally and transversely fissured. Leaves odd-pinnate, up to 5 in. long; leaflets 10-15 pairs, opposite, glabrous, leathery, oblong, 0.5 in. long, close together on the leaf axis. Flowers in 10-15-flowered, loose racemes, terminal on short, lateral branchlets; petals 3, sub-equal, yellow with red streaks. Pods thick, 3-8 in. long, fleshy, pendulous, irregularly curved; seeds 3-12, brown, shining, compressed with a shallow pit on each of the faces.

Distribution : Throughout India and Pakistan.

Uses : The wood is dark purplish-brown, extremely hard, heavy, tough, fibrous, durable and resistant to insect attacks; it is in great demand for wheels, mallets, planes, rice pounders, furniture, oil and sugar mills, mortars and pestles, ploughs, tool handles, cart shafts, axles, naves of wheels, side planks of boats, well construction, coopers' work and turning; it is valued as firewood and makes excellent charcoal, which is particularly used for gunpowder. The wood ashes are used for tanning and dehairing goat skins. The bark also is much used as a tanning material in the preparation of hides.

From the leaves is obtained a fixed yellow dye which colours woollen materials red; it imparts a green colour to silks already dyed with indigo. The leaves, flowers, and fruits are also used as auxiliaries in dyeing.

The acid flesh of the pod is extensively used for culinary purposes; it is also employed for cleaning metal vessels; an infusion of the flesh with sea water has been found to be good for cleaning silverware. The seeds are commercially valuable. They are very rich in the pectine, jellose, which finds a very extensive use in jam and jelly industries. From the seeds is extracted an amber-coloured oil, which is processed to be used as a varnish for painting idols and images. The seeds are finely ground and made into a cement with the help of a glue; this cement is considered to be one of the strongest wood cements; it has many other uses, one of which is of sizing country-made blankets.

Young plants, leaves, and flowers are edible.

All parts of the tree have many medicinal uses.

245. TAMARIX ARTICULATA VAHL.

Family: *Tamaricaceae*

Local Names: Asreli, farash, lal jhau.

Description: A middle-sized tree; bark rough, grey, long furrowed, with transverse shallow cracks; branchlets articulate, often hoary with saline efflorescence. Leaves minute, sheathing, blade reduced to a triangular tooth, covered with glands, jointed. Flowers bisexual or unisexual, male and female flowers on different individuals, pink, without stalks, in long, slender, interrupted spikes. Capsules 3-cornered.

Distribution: Indigenous in Sind, the Punjab up to 1,200 ft., extending east to the Jumna, Baluchistan.

Uses: The tree is planted as a wind-break and as a sand binder. The wood is white with a faint yellowish tinge, lustrous, moderately hard and tough; it is used for agricultural implements, Persian wheels, beds, broom handles, common brush backs, general carpentry, turnery and small ornaments; it is very useful as firewood and for making charcoal; it has also tanning properties.

The bark and the galls formed on the flowers by an insect contain as much tannin as oak galls; they are very valuable tanning and dyeing materials. They are used for tanning finer qualities of sheep and goat skins. The leather at first is coloured slightly pink or purple; with age it turns darker and brownish.

A manna, locally known as "misri lei," is formed on the twigs as a result of insect punctures. This manna is used for adulterating sugar.

The hoary twigs covered with saline efflorescence is often used for flavouring food.

The bark, galls and manna have medicinal uses.

246. TAMARIX DIOICA ROXB.

Family: *Tamaricaceae*

Local Names: Jau, jhau, pilchi.

Description: A moderate-sized shrub; bark dark coloured and cracked. Leaves minute, sheathing the branch bearing them, green with a broad white margin. Flowers unisexual, male and female flowers borne on different individuals; purple or light rose coloured, spirally arranged in short, dense, terminal, drooping, stalked spikes. Capsules oblong, tapering, 0.2 in. long, surrounded by the withered perianth.

Distribution : Sind to Assam and the Western Peninsula.

Uses : The wood is red and moderately hard; it is the principal source of firewood wherever it is available; it is also used for Persian wheels and turning; the branches and twigs are made into baskets and brooms, and used in the building of huts.

The galls formed on the flowers as a result of insect attack contain 50 per cent of tannin, and the leaves and the bark contain only 8 per cent; they are all used for tanning and dyeing.

247. TAMARIX GALLICA LINN.

Family : *Tamaricaceae*

Local Names : Jhau, kiri.

English Name : Tamarisk.

Description : A bush or a small, green, tree; branches slender, articulated. Leaves minute, covered with a fine bloom, white-margined, not sheathing the branch on which they are borne, smooth, scale-like. Flowers bisexual, minute, white or pink, crowded on slender panicled racemes at the ends of branches. Capsules minute, surrounded by the withered perianth.

Distribution : Sind, the Punjab, and throughout India from the Western Himalayas southwards to the Western Peninsula, in river beds and on the sea coast.

Uses : The wood is whitish, fairly hard but not strong; it is used for well construction, poles, rafters, agricultural implements, turnery, and lacquered work; it is much used as firewood, especially for steamers on the Indus.

Numerous galls are formed on the tree as a result of an insect attack; these galls, known as " sakun," contain as much tannic acid as oak galls, about 50 per cent, and are valuable as a tanning agent; they also contain a dye and gallic acid. The twigs also are used for tanning purposes.

A manna known as " gazanbeen " or " guzunjabin " is formed on the tree as a result of insect punctures; this manna

contains dextrine and organic acids among other things.
The bark, leaves, galls, and fruit have medicinal uses.

248. TECTONA GRANDIS LINN. F.

Family: *Verbenaceae*

Local Names: Sag, sagun, sagwan.

English Names: Indian Oak, Ship Tree, Teak.

Description: A large, deciduous tree; bark light brown or greyish, with shallow cracks, outer layers peeling off in thin flakes; branchlets grey, tomentose, quadrangular, channelled. Leaves opposite, elliptic or obovate, rough, glabrous above, grey-tomentose below, 1-2 ft. long. Flowers white, shortly stalked, in erect, terminal, cymose panicles, up to 3 ft. long. Fruit subglobose, about 0.5 in. diam., enclosed in the inflated, bladder-like calyx, outer wall covered with a felt of hairs, soft, inner wall bony, 1-2-seeded.

Distribution: Indigenous in Central and Southern India.

Uses: Sag is one of our outstanding timbers. The wood is dark golden-yellow when freshly cut, ageing to brown or almost black, moderately hard, oily, scented, strong, extremely durable, takes a beautiful polish, and does not corrode in contact with metal; the timber from South India is at times beautifully marked with dark brown streaks; the timber known to the trade as "Godavery Teak" is famous for its markings. The timber has varied and numerous uses and so is highly prized; it possesses excellent qualities for ship building, hulls of wooden ships, fittings of battleships, boats, masts and spars; it is extensively used for house building, bridge construction, piles, pit props in coal mines, high class joinery, furniture, cabinet work, carpentry of all kinds, railway carriage and waggon construction, railway sleepers, electric casing, well construction, wheelwright's work, solid wheels, ornamental veneers, ploughs and cooperage work in general; it is also in great demand for numerous minor purposes, such as combs, jars, bowls, toys, brush backs, bodies of pianos, organs and harmoniums, keys of violin, carving and turning, shingles, oars, helms, etc. The hard knots which occasionally develop on the trunks are prized for making tobacco pipes.

The wood is not only of economic value as timber, but is also valuable because of the tar oil that is extracted from it by distillation; scraps and rejections from the saw mill are used for this purpose; this oil is used as a varnish and as a substitute for linseed oil.

The bark contains a dye which is made use of in the Celebes for colouring matting a yellowish-brown.

The leaves also contain a colouring matter which is used for dyeing silk and cotton fabrics red or yellow and matting yellowish brown. The leaves are also used as packing and thatching materials, and made into plates and rough umbrellas.

The various parts of the tree have medicinal uses.

249. TERMINALIA ARJUNA W. & A.

Family: *Combrataceae*

Local Names: Anjan, arjuna, kahua, kohar.

English Names: Arjun Tree, White Murdah.

Description: A large, deciduous tree, trunk thick and often buttressed, almost glabrous; bark smooth, grey, flaking off in thin layers. Leaves oblong or elliptic, hard, glabrous, leathery, 3-6 in. long. Flowers without stalks, yellowish, in erect, short, axillary spikes, or in small axillary or terminal panicles, petals absent. Fruit ovoid oblong or obovoid, with 5 thick, narrow, striated wings, 1 in. or more long.

Distribution: Throughout Central and Southern India, common along the banks of rivers and streams.

Uses: The wood is brown and very hard; it is used for house building, carts, shafts, axles, naves of wheels, solid cart wheels, agricultural implements, mining props, well construction, water troughs, boats, oars, masts, and brush backs. The wood ashes are used in dyeing.

The most useful part of the tree is its bark which contains 20-24 per cent of tannin; it is extensively used for tanning and dyeing; the tannage can be used for making fine upper leather and excellent sole leather of light brown or buff colour, without an excessive red tint; this leather is soft and of firm texture.

The fruits hanging on the tree contain 7-20 per cent of tannin; the tannin content is much reduced in the fruits fallen on the ground; the fruits are not of any value as a tanning material, but it has been suggested that they can be used in the manufacture of paper.

The leaves are fed to tassar silk worms.

The bark has also valuable medicinal properties.

250. TERMINALIA BELLIRICA (GAERTN.) ROXB. EX. FLEMING.

Syn. T. belerica Roxb.

Family: *Combrataceae*

Local Names: Bahera, behada, tani.

English Names: Bastard Myrobalan, Bedda Nut, Beleric Myrobalan.

Description: A large, deciduous tree, often buttressed at the base, bark thick, bluish-grey, or brownish, with vertical cracks. Leaves at the ends of branchlets, alternate, broadly elliptic, 4-9 in. long, entire, with a translucent margin, downy when young, glabrous when mature. Flowers greenish-yellow, having an offensive smell; male and bisexual flowers mixed in unbranched spikes; petals absent. Fruit ovoid, 1 in. long, velvety; stone woody splitting into 2 valves.

Distribution: Throughout India and Pakistan, except the arid parts of Sind and Rajputana, in deciduous, mixed forests.

Uses: The wood is yellowish-grey, hard but not durable; however, it keeps well under fresh water; it is used for packing cases, coffee boxes, dugout canoes, side planks of boats, catamarans, Chittagong sampans, carts, shafts and axles, grain measures, ploughs, inferior house building, pit props in coal mines, turning, and coopers' work.

The fruit is astringent and is one of the well-known commercial myrobalans; it is inferior to chebulic myrobalan, and therefore is often mixed with the latter; the tannin content of the fruit without the stone is 25 per cent; leather tanned with this fruit is much plumper and softer than that tanned with the chebulic myrobalan; it is not only used for tanning leather but is also used for dyeing cloth and leather. The fresh fruit is used for making inks. The seeds are considered to be intoxicating when consumed in large quantities; they act as a narcotic poison.

The oil extracted from the seeds is used as a hair oil.

The leaves are valued as fodder for milch cattle.

The astringent fruit has medicinal uses.

251. TERMINALIA BIALATA STEUDEL.

Family: *Combrataceae*

Local Name: Chuglam.

English Names: Indian Silver Grey Wood, White Chuglam.

Description: A large tree. Leaves clustered near ends of branches, obovate, 5 in. long, long stalked, stalk 2.5-3.5 in. long, glabrous when adult. Flower spikes very long having both male and bisexual flowers, upper flowers male, lower bisexual; calyx brown pubescent or tomentose. Fruit 1.25-1.75 in. long, with 2 very broad wings.

Distribution: The Andamans.

Uses: The heartwood is not the same in all trees; it is of two kinds; in one kind it is decorative and in the other non-decorative; the former is highly figured and is known as silver grey wood, and the latter is light yellow when freshly cut, ageing to grey yellow and is known as white chuglam; the decorative wood is used for all kinds of decorative purposes, panelling, moulding, picture frames, furniture, ship's fittings, cabinet work, mounted veneers, interior fittings in buildings, etc.; white chuglam is used for construction work, motor body work, mathematical instruments, shafts, oars, masts, spars, tool handles, etc.

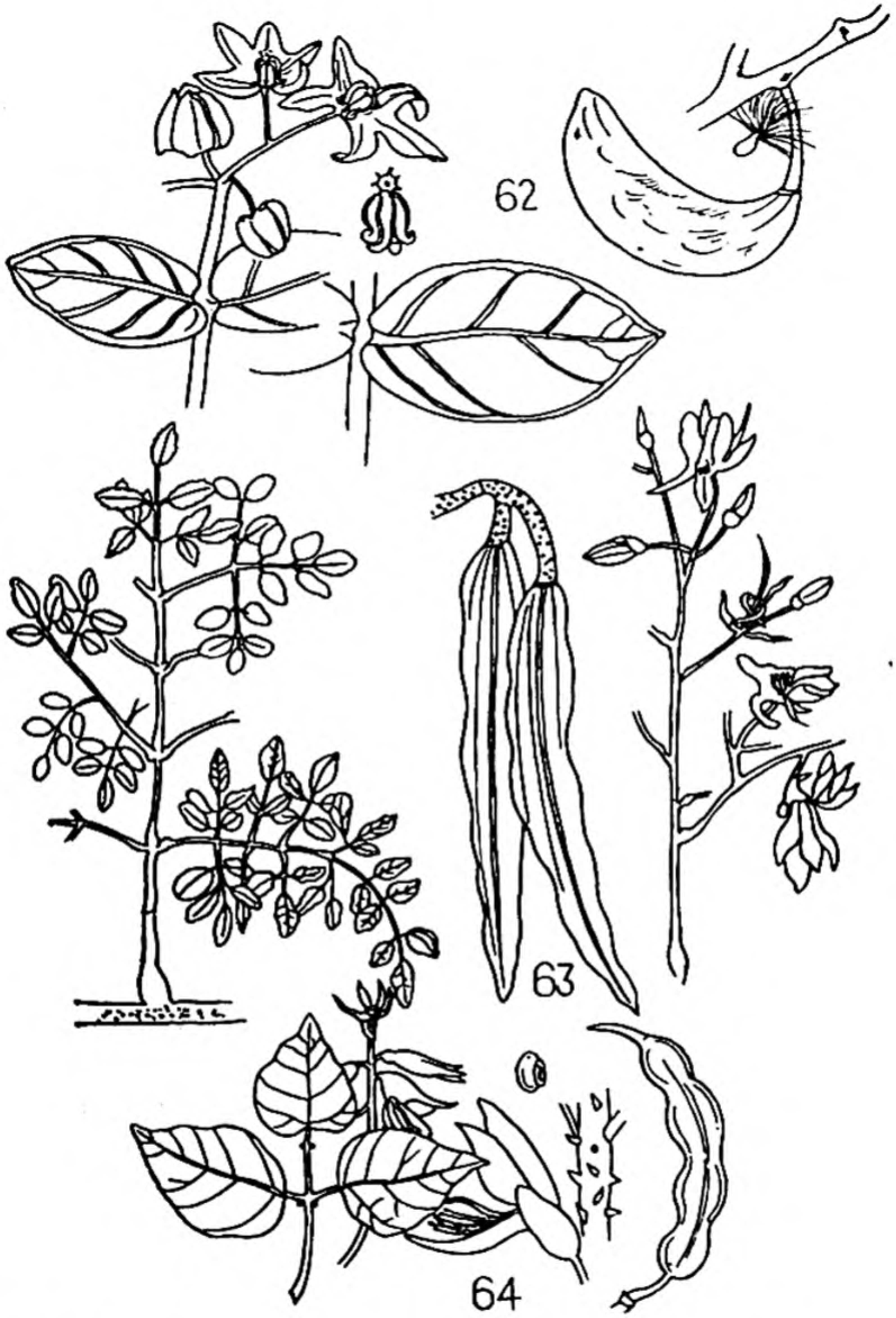
252. TERMINALIA CATAPPA LINN.

Family: *Combrataceae*

Local Names: Badam, hindi badam, jungli badam, taru.

English Names: Indian Almond, Malabar Almond, Malaya Almond.

Description: A tall, deciduous tree; bark rough, greyish-brown; branches whorled; stem often buttressed. Leaves clustered at ends of branches, alternate, obovate, 6-10 in. long, glabrous, stalk and mid-rib hairy. Flowers white, in solitary, axillary spikes, male and bisexual flowers on the same spike, upper flowers male, lower bisexual; petals absent. Drupes glabrous,



62, Calotropis gigantea. **63**, Moringa oleifera. **64**, Erythrina variegata.

ellipsoid, 2 in. long, compressed, outer covering fleshy, fibrous; stone hard.

Distribution : Common in Peninsular India, Bengal, North India, the Andamans.

Uses : The wood is light brick-red to brownish-red, lustrous, light, and durable; it is used for house building, yokes, and wheels. The bark and the leaves contain a black dye which is used for making India ink, and for colouring teeth; they are also used in tanning.

The fruit and the seeds are edible. The seed contains a large quantity of a fixed oil that resembles almond oil in taste and odour; it is used as a bland oil.

The leaves are fed to tassar silk worms.

The juice of the bark, leaves, and fruit has medicinal uses.

253. TERMINALIA CHEBULA RETZ.

Family : *Combrataceae*

Local Names : Harar, harra, hirda.

English Names : Black Myrobalan, Chebulic Myrobalan.

Description : A large, deciduous tree, often with a short crooked stem; bark thick, dark brown, having numerous vertical cracks. Leaves distant, often opposite, elliptic or ovate, 3-8 in. long, leathery, pubescent when young; leaf-stalk with a large gland on each side at the top. Flowers all bisexual, whitish or yellowish, odorous, without stalks in axillary or terminal panicled spikes; petals absent. Drupes pendulous, ellipsoidal or ovoid, 1.5 in. long, glabrous, light green, with minute yellow spots when unripe; on drying 5-ribbed; stones hard, bony.

Distribution : Throughout India and Pakistan, except in the arid tracts of Sind, West Punjab and Rajasthan.

Uses : The wood is dark purple, very hard, fairly durable and takes a good polish; it is used for house building, furniture, turnery, carts, shafts, axles, yokes, naves, felloes of wheels, agricultural implements, oars, bolsters of timber carts, etc.

The most valuable part of the tree is its fruit, which is the black myrobalan of commerce; it is the most important of all the myrobalans being the best tanning material of India and Pakistan for dyeing cotton. wool, and leather; the fruit is extensively used as an auxiliary with other dye-stuffs; in combination with iron salts it produces black dyes, and with alum a yellow dye. All the fruits on drying do not develop ridges; usually only the fruits with ridges are used for tanning and dyeing purposes; those that have failed to form ridges on drying are known as " bhonga hirda "; their interior is full of a black powder; they have been found to be useless for tanning and dyeing, but are used for making durable inks, with sulphate of iron or iron clay.

Tannic acid of the right standard can be prepared from the fruit; this acid is usually prepared from gall nuts which are not found in India or Pakistan, but are indigenous to Greece, Syria, Iran, and other Asiatic countries.

The fruits are also used for making a sweet conserve. The dried and powdered fruit pulp is used as a dentrifice.

As a result of insect attack galls are formed on tender leaves; these galls are as valuable as oak galls for dyeing and tanning; a most durable yellow is obtained from the galls in combination with alum, and a black with iron clay; these galls are also used for making inks.

Harra fruit is an important drug of the Hindu materia medica; the fruit and other parts of the tree are much used in Unani medicine.

254. TERMINALIA TOMENTOSA W. & A.

Family: *Combrataceae*

Local Names: Ain, asan, asna, matti, sadri, saj.

English Names: Laurel, Sain.

Description: A large, deciduous tree; bark rough black, deeply cracked; young parts yellowish-brown pubescent. Leaves leathery, hard, elliptic or ovate, 3-8 in. long, nearly opposite, glabrous or soft, silky tomentose, 1-2 glands near the base of the mid-rib, margins entire or toothed. Flowers bisexual, dull yellow, in erect, terminal or axillary panicles. Fruit 1-2 in. long, with 5, leathery, brown, thin wings, irregularly toothed on the margins.

Distribution: Widely distributed except in the arid regions of the Punjab, Sind and Rajasthan; in the west from Kangra in the Punjab to Assam in the east and southwards in the Peninsula to Travancore.

Uses: The wood is dark brown, hard, fairly durable and very handsome when polished; it is a very valuable timber and used extensively for building purposes; railway sleepers, ships, boats, carts, agricultural implements, toys, furniture, cabinets, oil mills, rice pounders, side-pieces of solid cart wheels, mining timber, piling, water-wheels, engine brake blocks, electric casing, rough carpentry, panelling, etc.; it is highly prized for ornamental veneers and as firewood. The wood ashes are used by dhobis in Oudh.

Throughout India and Pakistan the bark, which contains 15 per cent of tannin, is highly valued as a tanning and dyeing material; it is used for tanning skins and preserving fishing nets; it also yields a black dye, and is occasionally used as fish poison. In South India the bark is burnt to make lime for eating with "pan" (betel leaf), and for the special use of Jains and Brahmins. An astringent gum is obtained from the bark that is used as an incense and in the preparation of cosmetics. The astringent juice from the bark is used in the making of palm sugar.

The fruit also is used as a tan, but it is much inferior to harra (*Terminalia chebula*). The fruit is edible.

The tree is pollarded for tassar silk-worm cultivation.

255. THEMEDA ARUNDINACEA RIDLEY

Syn. T. gigantea Hack.

Family: *Gramineae*

Local Names: Kapur ghas, sarkhara, ulla.

English Name: Ulla Grass.

Description: A tall, tufted, perennial grass. Stem 9-18 ft. high, yellow, smooth, polished, compressed. Leaves long, up to 6 ft., linear, rough on both surfaces; sheaths compressed, smooth. Inflorescence a panicle consisting of numerous racemes, each raceme having a number of spikelets, some of them covered with golden hairs, and some with short brown hairs.

Distribution: Common in the forest savannahs of Northern India and Pakistan.

Uses: The grass is much used in the manufacture of good quality packing and wrapping papers, and also of cheap badami paper. The fibre extracted from the stem is used for making ropes and cordage. The stems are also used for making walls of huts.

256. THESPESIA POPULNEA SOL.

Family: *Malvaceae*

Local Names: Bhendi, parash, parash jhad, parash pipal.
English Names: Portia Tree, Tulip Tree.

Description: A small, evergreen tree; bark brown, rough, often knobby; young parts covered with brown scales. Leaves cordate, entire, often with glandular pores at the top of the stalk, 3-7 in. long. Flowers axillary, solitary or 2 together; calyx cup-shaped; corolla yellow with a purple centre. Capsules globose or oblong, depressed, 1.5 in. long, scaly, 5-valved, always remaining closed.

Distribution: Coastal forests of India and Pakistan.

Uses: The tree yields a number of useful products. The wood is dark red, tough, strong, hard, smooth and durable, takes a good polish and can be readily stained; it is used for house building, furniture, carts, carriages, waggons, yokes, spokes and felloes of wheels, ploughs, gun-stocks, coopers' work, turnery, and carving; it is very valuable for shafts, and in Madras it is particularly preferred for ribs and knees of boats. The wood contains a tannin and an orange yellow liquid colouring matter which dyes wool deep brown.

The bark is fibrous and is used for caulking boats; the fibre is good and strong; it is converted into cordage and bags. Like the wood the bark also contains a tan and a dye. The capsules contain a yellow dye resembling gamboge. An oil is extracted from the seeds which is used for burning in lamps.

All parts of the tree are used in various ways in indigenous medicine.

257. TOONA CILIATA M. ROEM

Syn. Cedrela toona Roxb.

Family: *Meliaceae*

Local Names: Deodari, maha limbu, maha nim, toon, tooni.
English Names: Indian Mahogany, Moulmein Cedar, Red

Cedar, Toon, Sandal Nim.

Description : A large, nearly evergreen, glabrous tree; branches spreading; bark thin, rough, dark grey-brown. Leaves even-pinnate, up to 18 in. long; leaflets opposite, 10-20, lanceolate or ovate-lanceolate, entire or undulate, membranous. Flowers in terminal panicles, white, small, honey-scented. Capsules oblong, up to 1 in. long, rough, with raised white spots, dehiscent. Seeds numerous, winged.

Distribution : Sub-Himalayan tract from the Indus eastward, Sikkim, Assam, the Western Ghats, and low hills of the Peninsula.

Uses : The wood is brick-red at first ageing to a rich reddish-brown, soft, shining, fragrant and durable, and has an acrid taste; it is not attacked by white ants. As the wood is light, cheap, and easy to work it can be used for many purposes even in small workshops. It is an excellent wood for backings, linings, panelling doors, cupboards and general carpentry; it is also used for house building, furniture, tea chests, cigar boxes, well construction, dugouts, sampans, masts, oars, Indian musical instruments like sitar, oil casks, gunstocks, carving, toys, etc.

The flowers contain nyctanthin, quercetin and a flavone dye. A beautiful yellow or a red dye is obtained by boiling the flowers. Cotton fabric is dyed yellow; the addition of turmeric to the decoction deepens the colour to orange yellow. The dye is also used for silken fabrics. A dye is also obtained from the seed. The seeds and the leaves are fed to cattle.

The bark is a powerful astringent and is often employed as a substitute for cinchona bark; it has other medicinal uses as well.

258. TREMA ORIENTALIS (LINN.) BLUME

Family: *Ulmaceae*

Local Names : Gol, jiban, jilan, kargol.

English Names : Charcoal Tree, Indian Nettle Tree.

Description : A shrub or small twiggy tree, marked with scars; branchlets silky pubescent. Leaves alternate, lanceolate, oblique at the base, finely serrated, 2-6 in. long, rough above, white tomentose below. Flowers unisexual, male and female flowers on the same plant; male cymes compact, female cymes lax. Capsules very small, black, glabrous.

Distribution: In the damp forests of India and Pakistan on the plains.

Uses: The wood is light and soft and is useful for making charcoal for gunpowder. But the value of the tree is in its fibre which peels off the stem in thin narrow bands, and is used for making ropes, twine, and coarse cloth. The fruit is sweet and edible.

259. TREWIA NUDIFLORA LINN.

Family: *Euphorbiaceae*

Local Names: Bhillaura, gumhar, petari, tumri.

Description: A medium-sized or large, deciduous tree; young shoots, leaves and inflorescence covered with cottony tomentum. Leaves opposite, ovate or cordate, 4-6 in. long. Flowers unisexual, male and female flowers on different individuals. Male flowers in pendulous 4 in. long racemes; female flowers long stalked, solitary or 2-3 together. Fruit globose, 1-1.5 in. diam., 2-4-seeded.

Distribution: Indigenous in Sub-Himalayan tract, from the Jumna eastwards, ascending to 3,000 ft., Assam, Khasi Hills, Bengal, and the Peninsula.

Uses: The wood is white or pale brownish-grey, soft, extremely light and not durable; it is used for making drums, yokes, carved images, agricultural implements, tea chests, packing cases and coopers' work; it is an excellent wood for matches and match boxes.

The ripe fruit is edible.

260. TRIGONELLA FOENUM-GRAECUM LINN.

Family: *Leguminosae*

Local Name: Methi.

English Name: Fenugreek.

Description: An annual, erect, strongly scented robust herb. Leaves pinnate; leaflets 3, oblanceolate-oblong, 0.75-1 in. long, margins toothed. Flowers axillary, lemon-yellow. Pods **2-3** in. long, scythe-shaped, long-beaked, **10-12**-seeded.

Distribution: Wild in Kashmir, the Punjab, and the Upper Gangetic Plain. Cultivated in many parts of India and Pakistan.

Uses: The herb contains the alkaloid trigonelline and an essential oil, and is used as an insect repellent. In the Punjab the dried plants are mixed with stored grain in bins to protect the grain against insect attack. The herb is also used as a vegetable and the seeds as a spice. The seeds serve as an adulterant of coffee and as a flavourer for obscuring the musty odour of cattle feed; they are used in perfumery; they yield a yellow dye and also the alkaloid trigonelline.

261. TYPHA ELEPHANTINA ROXB.

Family: *Typhaceae*

Local Names: Hagla, pun.

English Name: Elephant Grass.

Description: A perennial, marsh herb, **6-12** ft. high. Leaves erect, spongy, **3**-cornered, margins wavy above the middle. Flowers unisexual, male and female flowers on the same plant, perianth of slender hairs; male spikes **8-12** in. long, stalk clothed with short hairs, bracts **3** or more; female spikes much stouter, **6-10** in. long.

Distribution: Sind, banks of the Indus, and throughout the Konkan.

Uses: This grass-like shrub is planted as a soil binder; the long, strong roots bind the soil of the river banks and prevent them from falling in. The plant is used for making ropes, mats, and baskets. Villagers make temporary boats, called " tinho," out of this shrub for crossing the river in flood. In Sind the pollen of this plant is used for making the preparation called " boor " or " booratoo," which is commonly eaten by them.

262. URENA LOBATA LINN.

Family: *Malvaceae*

Local Name: Wan-bhendi.

Description: A very variable, hairy, herbacious plant. Leaves cordate, 2-7 in. long, 5-7-lobed, 1-3 glands on the under surface. Flowers clustered, pink. Fruit densely pubescent, covered with hooked bristles, not opening when mature.

Distribution: Common throughout the hotter parts of India and Pakistan.

Uses: The plant is useful because of its fibre; it is soft, fine and shining, and is used for cordage and for making coarse cloth; tough paper can be made out of it. The charcoal made from the plant is useful for blackening teeth.

The leaves are employed to adulterate patchouli (*Pogostemon* spp.).

The seeds are mucilagenous and are used for making soap; they are also used in the manufacture of cereal foods.

263. VATERIA INDICA LINN.

Syn. V. malabarica Blume

Family: *Dipterocarpaceae*

Local Names: Dhup, dhup maram, dhup paini, perum piney, piney maram.

English Names: Indian Copal Tree, Piney Varnish Tree, White Dammar of South India, White Dhup.

Description: A large, handsome, evergreen tree, branchlets and inflorescence covered with fine, grey pubescence; bark smooth, grey. Leaves leathery, glabrous, ovate-oblong, blade 5·8 in. long. Flowers white, in large, terminal corymbs. Fruit ovoid, 2-2.5 in. long, leathery, fleshy, grey outside; seeds large; seed-leaves fleshy, filled with fat (piney tallow).

Distribution: The Western Ghats from Kanara to Travancore, ascending to 4,000 ft.

Uses: The wood is light yellow, turning light brown on exposure, moderately hard, rough and porous; it is not in great demand, but it is a useful plank timber; locally it is used for dugouts, cheap ceiling and flooring planks, packing cases, coffee and tea chests, coffins, masts of small country crafts.

The tree is very valuable because of the oleoresin that is obtained from the trunk; when soft the resin is known as " piney varnish " or " piney gum "; when hard as " dammar " or " Indian Copal." It is a most valuable Indian dammar; it is used for making varnish for carriages and furniture; it is also used for varnishing pictures and anatomical preparations, for making candles which diffuse a pleasant smell, and as ornaments under the name of amber (kehroba).

A mixture of this resin, fish oil and the oil from the seeds of " poon " (*Calophyllum inophyllum*) is used for caulking boats.

From the seed is obtained a vegetable butter, known as " Malabar tallow," " Vateria fat " or " piney tallow "; it is extensively used for burning in lamps, as a substitute for ghee, and in the manufacture of soaps and candles; the refined fat is used in confectionery. The fruit rind contains 25 per cent of tannin.

The bark is bitter and astringent; in Ceylon it is utilized for controlling fermentation in toddy, palm juice, and used in the manufacture of arrak and jaggery.

The vegetable butter in the seed is used medicinally.

264. VENTILAGO MADRASPATANA GAERTN.

Family: *Rhamnaceae*

Local Names: Bika, kali bel, kanvel, lokandi, popli, surabi.

Description: A large, woody climber; stem spirally covered with knobs; bark thin, dark grey, smooth, fissured; young parts pubescent. Leaves ovate to oblong-lanceolate, blade 2-3 in. long, entire or toothed, shining above, paler beneath. Flowers numerous, greenish-yellow, strongly scented, clustered along branches of terminal panicles. Nuts 0.25 in. diam., pubescent.

Distribution: The Western Ghats, North Konkan, Central and Southern India.

Uses: The bark is used for making cordage and in Ceylon as a tanning material; with " chaya root " (*Oldenlandia umbellata*) the bark gives a chocolate colour; this chocolate colour is specially seen on borders of cloth in Mysore, Bellary, Hyderabad, and other places in the South.

The roots give a valuable red dye which is used for dyeing cotton fabrics and tassar silk.

265. VETIVERIA ZIZANIOIDES NASH.

Family: *Gramineae*

Local Names: Khus, lavancha, nash, panni, vetti-ver.

English Names: Botha Grass, Khus-khus, Vetiver.

Description: A densely tufted, perennial grass; underground stem branching, with spongy, aromatic roots, aerial stem tall, up to 5 ft. high, smooth, glabrous; leaf-sheaths covering the stem, compressed, very smooth, firm, polished; leaf-blades 1-3 ft. long, erect, rigid, firm or somewhat spongy, linear, usually glabrous, pale green. Flowers in conical panicles, 12 in. long, branches whorled, having racemes of spikelets towards the tips, spikelets pale or reddish-brown or purplish.

Distribution: Wild throughout India and Pakistan.

Uses: The commercially important part of the grass is its roots which yield the fragrant vetiver or khus-khus oil, one of the most viscid of essential oils; it is therefore in great demand for fixing volatile oils; the essential oil usually distilled in Bharatpur, Rajasthan, is of the heavier type and is generally used for perfuming high-class soaps, whereas the oil distilled in Uttar Pradesh (the United Provinces) is of the delicate type and is extensively used in perfumery and is a constituent of many favourite scents; the essential oil is also used for flavouring sherbets. The roots are much used for making " attars "; they are also kept in wardrobes for perfuming clothes and as an insect repellent. These fibrous roots are made into tatties, chicks, mats, fans, etc. The grass is used for thatching and paper making.

The roots are used as a febrifuge and tonic. The seeds contain a red coloured oil which has medicinal uses.

266. VILLEBRUNEA INTEGRIFOLIA GAUD.

Family: *Urticaceae*

Local Names: Ban-rhea, bouriha, lipia.

English Name: Wild Rhea.

Description: An evergreen plant; branches, petioles and leaves beneath pubescent or tomentose. Leaves 6-14 in. long, elliptic-oblong, membranous, entire or crenate; stalk 1-6 in. long. Flower clusters globose, in small shortly stalked, hairy cymes branching in pairs.

Distribution: Common in the forests of the Eastern Himalayas, up to Khasi Hills and Jayanti Hills in Assam, Chittagong, the Andamans.

Uses: It is a stingless fibrous nettle; the fibre is silky, excellent in quality and 2 or more inches long, it is commonly used by the local people for making ropes, cordage and sack cloth; it is capable of being used for textile purposes, though it is at present little known.

267. VIOLA ODORATA LINN.

Family: *Violaceae*

Local Name: Banaf shah.

English Names: Sweet Violet, Violet.

Description: A low, trailing plant, rarely 6 in. high; underground stem thick, scaly, with rooting runners; aerial stem short or absent. Leaves broadly cordate or ovate to kidney shaped, as broad as long, 1 in. diam., smooth or slightly pubescent, crenate. Flowers fragrant; petals ovoid, deep violet inside with a bluish-white base, dark blue outside, with a deep violet, short spur. Capsules rounded, 3-angled, downy, often purplish.

Distribution: Common in Kashmir and Murree Hills up to 5,000-6,000 ft.

Uses: The shrub is valued for its flowers from which is extracted a perfume unrivalled in popularity. An essential oil is obtained from the leaves; it is used in perfumery and for scenting soaps; the perfume of the leaf extract is very attractive, even when diluted.

The leaves and flowers are used locally for medicinal purposes.

268. VITEX ALTISSIMA LINN. F.

Syn. V. pinnata Linn.

Family: *Verbenaceae*

Local Names: Bulgi, burnige, milla, naviladi.

Description: A moderate-sized or large, deciduous tree, very beautiful when in flower; bark grey, scaly; branchlets quadrangular, covered with fine hairs. Leaves with 3 leaflets; leaflets without stalks, lanceolate, 3-6 in. long, glabrous above, softly pubescent beneath. Flowers numerous, in many, erect cymes arranged along the quadrangular, tomentose branches of the large terminal panicles; calyx grey-tomentose; corolla white with a bluish tinge, pubescent outside, 2-lipped. Drupes irregularly globose, 0.25 in. diam., purple white dotted, glabrous, seated on the persistent calyx.

Distribution: Common on the Western Ghats and in Southern India.

Uses: The wood is light olive-grey to olive-brown, hard, strong, smooth, and durable under water, and takes a good polish; it is classed as an excellent timber for furniture, cabinet-work, turning, building purposes, well construction, carts, felloes of wheels, agricultural implements, and combs. In some parts of Southern India it is specially used for building Hindu temples. A yellow dye is extracted from the wood.

269. VITEX NEGUNDO LINN.

Family: *Verbenaceae*

Local Names: Indrani, nagdoz, nengar, nirgandi, shiwari.

English Name: Indian Privet.

Description: A shrub or small tree; branchlets, leaf-stalks densely white tomentose; branchlets quadrangular; bark thin, grey. Leaves opposite, stalked, digitately divided; leaflets 3-5, unequal, lanceolate, entire, glabrous above, densely white tomentose beneath. Flowers blue-purple, crowded in short cymes, forming erect, terminal, tapering panicles. Fruit a drupe, black, ovoid, 0.25 in. long.

Distribution: Throughout India and Pakistan, ascending to

5,000 ft. in the north-west Himalayas.

Uses: The wood is greyish-white, hard; it is used for building purposes and firewood; the branches are utilized for wattle-work; the ashes of the plant are used in dyeing.

The whole plant is very aromatic and the leaves act as an insect repellent and so are used for preserving stored grains against insect attacks.

The roots and leaves have medicinal uses.

270. WOODFORDIA FRUCTICOSA (LINN.) KURZ.

Syn. W. floribunda Salisb.

Family: *Lythraceae*

Local Names: Dhai, dhaora, dhaori, dhau, dhayati.

Description: A large, much-branched, deciduous, shrub; bark thin, grey, scaling off in small patches. Leaves opposite, sometimes in whorls of 3, without stalks, ovate-lanceolate, 1.5-4 in. long, dark green and softly tomentose above, underside hoary with black glandular dots. Flowers numerous, in short, clustered panicles from the axils of fallen leaves on the old wood; stalks short, pubescent; calyx tubular, bright red, pubescent; petals 6, red; filaments of stamens red. Capsules 0.5 in. long, enclosed in the persistent calyx tube, opening by 2 valves.

Distribution: Throughout India and Pakistan, up to 5,000 ft. in the Himalayas.

Uses: The plant is noted for the dye extracted from the flowers, twigs, and leaves. From the flowers is obtained a red dye when boiled in water with " al " (*Morinda tinctoria*) roots; it is employed in dyeing silk, cotton, and leather; with the alizarin dye the flowers are used to modify the dyeing process in order to increase the beauty of its shade. The dried flowers contain 20 per cent of tannic acid and so are used in the same way as Tamarisk galls.

The twigs and leaves also yield a yellow dye used in calico printing. The leaves are one of the commonest sources of tanning materials in India and Pakistan; they contain 12-20 per cent of tannin; the bark also is a valuable source of tanning material; it contains 20-27 per cent of tannin, and in its tanning properties it is not inferior to " avaran " (*Cassia auriculata*).

From the stem exudes a gum which is much used in Mewar and Harauti for protecting parts of fabrics which are not to be coloured during the process of dyeing.

The wood is used as firewood.

The leaves and flowers find a prominent place in indigenous medicine.

271. WRIGHTIA TINCTORIA BR.

Family: *Apocynaceae*

Local Names : Dudhi, kalakudi, kalakura.

Description : A small, deciduous, glabrous or pubescent tree; bark rough, greyish. Leaves ovate or oblong-lanceolate, 2.5-6 in. long, thin, membranous. Flowers white or pale yellow, fragrant, 0.5-0.75 in. across, in lax, spreading cymes, with slender branches; corona of numerous, unequal, white scales. Follicles 2, united at the tips, 5-20 in. long, slender, pendulous.

Distribution : Rajasthan, Central and Southern India.

Uses : The wood is white to light, lemon yellow, moderately hard and resembles ivory; it is very valuable and extensively used for carving, turning, combs, toys, yokes, bedstead legs, cups, plates, chessmen, pen-holders; it is also employed for building purposes.

The leaves turn black when dry; they yield an indigo-like blue dye, which is known in Mysore as " pala indigo "; the leaves also serve as wrappers for local made cigarettes.

An indigo-like blue colouring substance is obtained from the seeds; in the Konkan they are traded under the name of " goda indrajao," and are used as an anthelmintic.

The young leaves and pods are used as vegetables.

272. WRIGHTIA TOMENTOSA ROEM. & SCH.

Family: *Apocynaceae*

Local Names : Daira, dudhi, kala inderjao, pala.

Description : A small, deciduous tree; bark thick, grey, corky;

branchlets and leaves soft tomentose. Leaves elliptic or obovate, 2-4 in. long, slightly leathery, pubescent above, paler and tomentose beneath. Flowers yellowish-white, unpleasantly scented, 1 in. across, in axillary, stiff, erect, densely flowered cymes; calyx tomentose outside, glandular within; corona orange coloured, consisting of 5-10 fringed scales. Follicles 6-8 in. long, cylindric, brown, glabrous, covered with white raised dots.

Distribution : Throughout India and Pakistan, from the Indus eastwards and southwards, chiefly in deciduous forests.

Uses : The wood is white to yellowish-white or light lemon-yellow; it is a valuable timber and locally it is extensively used for furniture, packing cases, combs, carving and turnery, toys, picture frames and pen-holders; in places like Rajasthan, it is used for lacquer work and turnery articles; on the west coast it is used as pegs in the building of sea-going dugouts.

An aqueous yellow dye is made from the juice of the plant. The juice is used by the Nepalese to stop bleeding. The fruit contains a floss which is used as stuffing.

The bark of the stem and the roots are used as an antidote for snake-bite. The seeds contain a red coloured oil which has medicinal uses.

273. XYLIA DOLABRIFORMIS BENTH.

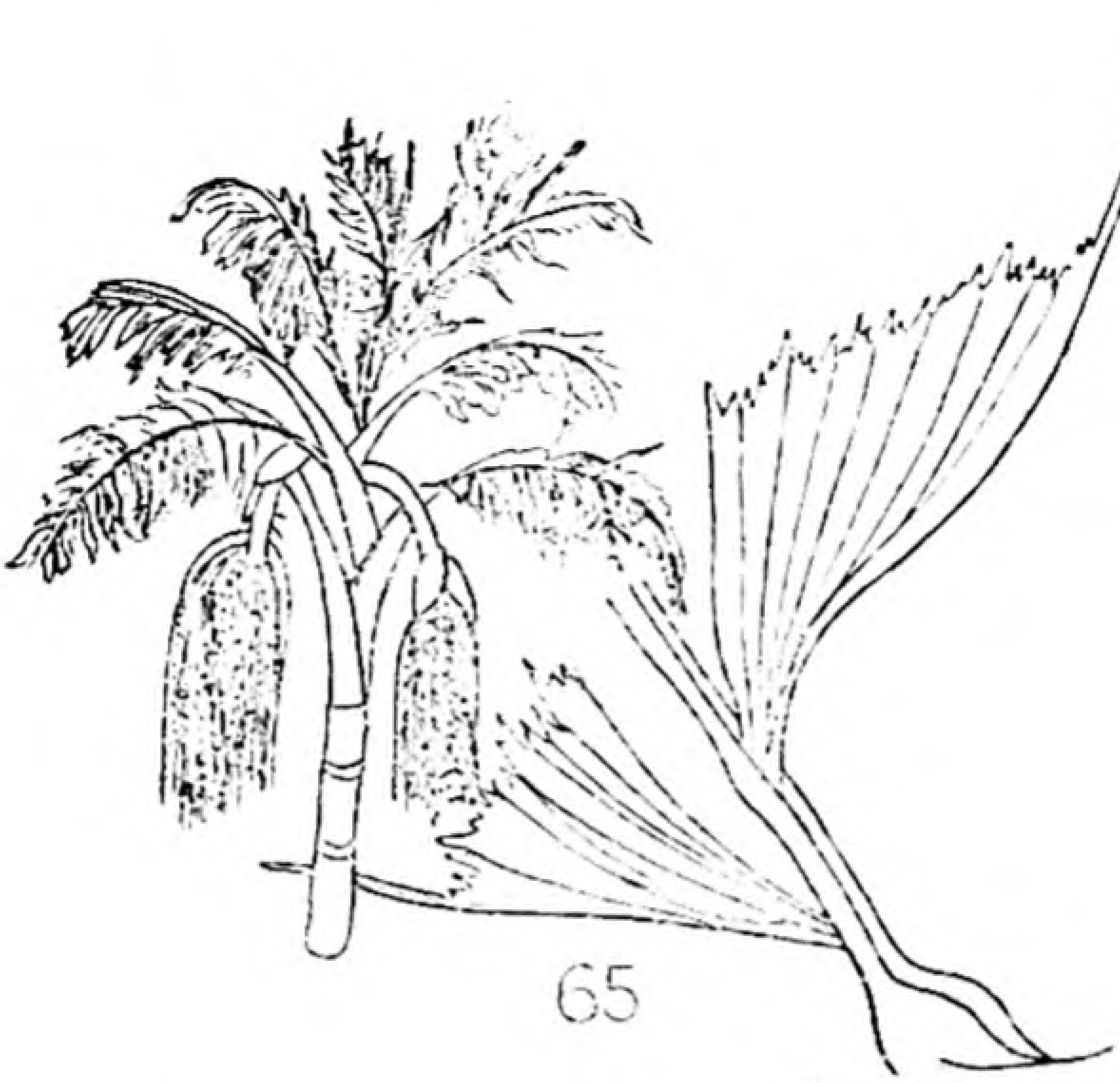
Family : *Leguminosae*

Local Names : Irul, jamba, jambu, suria.

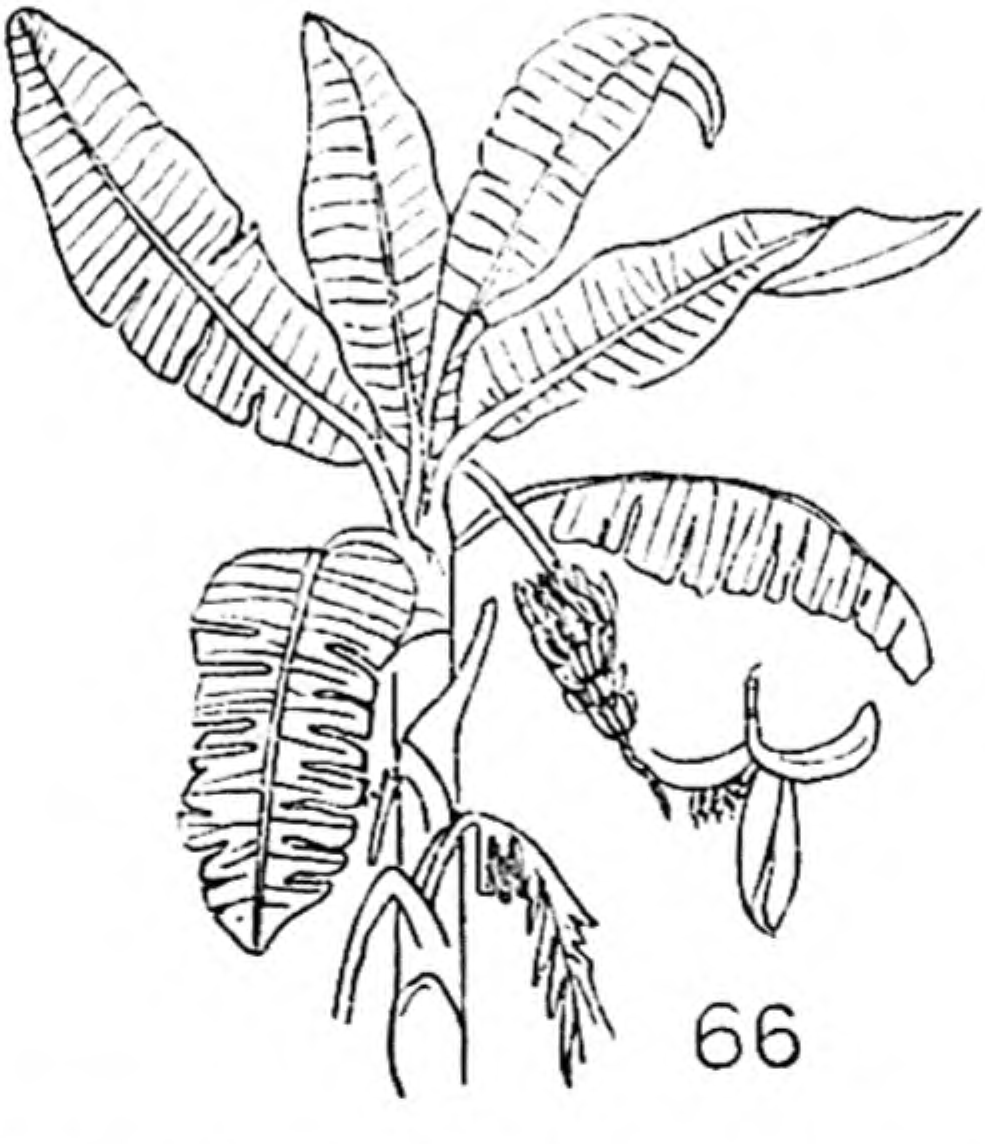
English Names : Ironwood of Arracan, Ironwood of Burma, Ironwood of Pegu.

Description : A very large, deciduous tree; bark smooth, grey, scaling off in great, thick, irregular patches; young shoots pubescent. Leaves with one pair of pinnae at the end of a common stalk, with a gland between the pinnae; leaflets 2-6 pairs, ovate-oblong or ovate, slightly leathery, diminishing in size from the top, terminal leaflet 3-6 in. long. Flowers pale yellow, fragrant, in long-stalked, globose heads, 0.5-0.75 in. diam. Pods 4-6 in. long, flat, woody, light brown, glabrous; seeds discharged from the pods, 6-10, brown, shining.

Distribution : Commonly found on the west coast from Bombay southwards to Travancore, Madhya Pradesh (the Central Provinces), and the Northern Circars.



65



66

65, Caryota urens. 66, Musa paradisiaca.

Uses: The wood is very hard, durable, reddish-brown, tough and strong, not attacked by white ants and resists action of water; it is a favourite timber for the construction of sea-going craft; it is particularly in demand as keel and stem- and stern-post wood; it is also extensively used for house building, bridge construction, dock work, dugouts, canoes, railway sleepers, railway waggon construction, telegraph posts, agricultural implements, pit props in coal mines, oil presses, yokes, well construction, bolsters and solid wheels of heavy timber carts, naves, spokes and felloes of wheels, bows, tool handles, turnery, etc.

The bark and the wood yield a tanning material, and the seeds an oil.

274. ZIZUPHUS JUJUBA (LINN.) LAM.

Family: *Rhamnaceae*

Local Names: Ber, bor.

English Names: Chinese Date, Indian Plum, Jujub Tree.

Description: A medium-sized tree; bark nearly black and irregularly cracked; branches drooping, armed with spines in pairs, one straight the other curved; branchlets, leaf-stalks, underside of leaves and inflorescence densely white or tawny tomentose. Leaves alternate, variable from ovate-oblong to nearly round, dark-green, shining above, entire or finely toothed, up to 2.5 in. long. Flowers greenish-yellow, crowded in small, axillary cymes. Fruit varying in size and shape, fleshy, dark brown or orange or red when ripe; stone wrinkled, bony, 2-celled.

Distribution: Indigenous and naturalised throughout India and Pakistan; very common in dry regions.

Uses: The wood is hard, reddish in colour, tough, strong and durable, and takes a good polish. It is everywhere used for saddle trees, agricultural implements, construction of villagers' houses, well construction, oil mills, yokes, tool handles, sandals, bedstead legs, golf clubs, gun-stocks, shafts and axles of carts, naves, spokes and felloes of wheels, Persian wheels, toys, and turnery; the wood makes excellent fuel.

The bark contains 4-9 per cent of tannin and is used as a tanning material. In Burma the fruit is used for dyeing silk; it is edible and makes a refreshing beverage; in Abyssinia the fruit is also employed as fish poison.

The leaves make good cattle fodder and are also fed to silkworms.

The bark and the roots are of medicinal value.

275. ZIZUPHUS XYLOCARPUS WILLD.

Family: *Rhamnaceae*

Local Names: Bhander, ghot-ber, goti, katti ber.

Description: A large straggling shrub or small tree; branchlets, underside of leaves and inflorescence pubescent or tomentose; branches often without spines. Leaves broad-ovate or roundish, finely toothed, 1.5-3 in. long. Fruit globose, 0.5-1 in. diam., grey-tomentose, at first fleshy, later almost dry, 3-celled, 3-seeded.

Distribution: Sub-Himalayan tracts from the Sutlej eastwards to Bengal, throughout the dry forests of Madhya Pradesh (Central Provinces), Madhya Bharat (Central India), the Deccan, South India, and Rajasthan.

Uses: The wood is brown, hard, tough, durable and distinctly attractive; it is commonly used for carts, cart wheels, construction of inferior class houses, agricultural implements, tool handles, etc. It makes excellent torches; it can be used for small panels, beading, inlay and similar ornamental purposes.

The bark contains 7 per cent of tannin, and is used as a tan and for making blacking; in Saugor district the bark is in great demand for tanning. The fruit also contains 23 per cent of tannin, and is employed in the manufacture of blacking for leather.

The young shoots, leaves, and fruits are used as cattle fodder: the seeds are edible.

APPENDIX I

Classification of Plants according to their Uses

(*Note*: The numbers given in this Appendix refer to the serial numbers of the plants described.)

Timbers

1, 5, 8, 10, 16, 18, 19, 20, 21, 24, 25, 26, 27, 28, 29, 30, 31, 34, 35, 37, 38, 41, 42, 43, 44, 46, 47, 48, 49, 50, 51, 54, 55, 56, 59, 60, 61, 62, 63, 64, 67, 69, 70, 76, 77, 78, 80, 83, 84, 86, 87, 88, 89, 91, 92, 93, 97, 99, 101, 107, 108, 110, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 126, 127, 130, 131, 132, 133, 136, 141, 142, 143, 144, 145, 146, 149, 152, 154, 155, 156, 160, 161, 162, 163, 164, 165, 166, 167, 169, 170, 171, 172, 174, 175, 176, 177, 178, 179, 180, 181, 183, 185, 186, 189, 191, 195, 196, 199, 200, 201, 202, 203, 204, 205, 207, 208, 209, 210, 211, 212, 213, 214, 216, 217, 219, 224, 225, 227, 228, 230, 232, 234, 235, 236, 237, 238, 239, 240, 242, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 255, 256, 257, 259, 263, 268, 271, 272, 273, 274, 275.

Fibres

2, 3, 4, 8, 9, 10, 11, 15, 22, 23, 32, 36, 37, 46, 51, 52, 54, 57, 58, 59, 63, 68, 71, 72, 75, 78, 83, 89, 96, 97, 99, 100, 103, 113, 127, 128, 131, 140, 143, 144, 145, 146, 148, 150, 151, 152, 157, 162, 164, 166, 173, 181, 184, 187, 188, 195, 197, 199, 200, 222, 223, 225, 226, 234, 235, 236, 237, 255, 256, 258, 261, 264, 266, 271.

Dyes and Tans

5, 6, 7, 8, 9, 10, 11, 12, 16, 17, 19, 26, 27, 28, 29, 31, 34, 38, 42, 45, 50, 51, 52, 53, 57, 61, 62, 63, 65, 66, 67, 71, 78, 82, 85, 86, 87, 89, 90, 91, 92, 94, 102, 104, 115, 123, 124, 125, 127, 133, 134, 136, 138, 139, 141, 146, 147, 149, 156, 158, 159, 160, 163, 164, 165, 166, 167, 169, 170, 171, 172, 177, 179, 180, 182, 183, 187, 190, 192, 193, 194, 197, 198, 203, 204, 210, 211, 213, 215, 216, 217, 221, 224, 229, 232, 234, 239, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 253, 254, 256, 257, 260, 264, 268, 270, 271, 272, 273, 274, 275.

Fats, Oils, Detergents and Waxes

6, 13, 17, 19, 22, 26, 28, 39, 46, 47, 62, 69, 70, 75, 79, 81, 82, 89, 95, 97, 112, 124, 135, 136, 151, 159, 160, 161, 168, 169, 170, 175, 179, 180, 184, 196, 207, 218, 220, 225, 227, 228, 230, 232, 235, 250, 252, 256, 263.

Perfumes, Essential Oils and Cosmetics

7. 14, 19, 28, 37, 60, 73, 79, 81, 94, 95, 96, 104, 105, 106, 125, 127, 137, 147, 150, 160, 167, 168, 172, 174, 178, 179, 180, 186, 191, 197, 206, 214, 227, 229, 232, 233, 254, 260, 265, 267.

Resins, Varnishes, Paints, Lacquers and Dammars

31, 37, 60, 62, 69, 74, 75, 82, 88, 119, 146, 154, 159, 178, 202, 203, 218, 219, 231, 232, 244, 248, 263.

Gums, Mucilage and Glue

5, 7, 8, 10, 11, 16, 19, 27, 31, 34, 46, 51, 62, 63, 69, 92, 96, 99, 115, 130, 136, 145, 150, 153, 162, 166, 169, 184, 186, 195, 199, 210, 225, 234, 236, 237, 262, 270.

Cements

7, 12, 16, 19, 42, 59, 81, 101, 129, 131, 132, 133, 196, 225, 244.

Firewood and Charcoal

5. 10, 17, 21, 25, 31, 34, 45, 47, 56, 60, 71, 76, 87, 97, 101, 110, 112, 113, 118, 120, 149, 152, 171, 174, 180, 188, 190. 203, 208, 214, 215, 224, 227, 229, 240, 242, 244, 245, 247, 253, 258, 269, 270, 273.

Pesticides, Insect Repellents and Weedicides

6, 14, 15, 17, 18, 22, 27, 31, 33, 37, 39, 40, 46, 48, 57, 63, 72, 75, 80, 82, 104, 106, 111, 115, 137, 147, 169, 170, 174, 175, 189, 195, 198, 206, 207, 212, 214, 227, 229, 230, 231, 260, 264, 269.

Paper and Wood Pulp

1, 10, 15, 35, 36, 37, 38, 44, 48, 49, 55, 58, 59, 63, 89, 99, 109, 110, 128, 131, 132, 133, 151, 152, 153, 157, 166, 174, 185, 188, 196, 201, 221, 223, 226, 237, 238, 255, 262, 265.

Beverages

10, 15, 22, 23, 31, 32, 33, 35, 40, 59, 71, 75, 83, 97, 98, 99, 112, 130, 135, 142, 143, 157, 169, 170, 175, 187, 199, 200, 213, 216, 242, 260, 273.

Matches

24, 29, 35, 60, 62, 118, 141, 156, 162, 166, 171, 194, 201, 203, 212, 224, 259.

Fertilizers

15, 17, 46, 59, 60, 120, 124, 169, 170, 184, 206, 209, 210.

APPENDIX II

Glossary of Botanical Terms

achene - - a small, dry, one-seeded fruit that does not open even when mature.

alternate - - placed singly at one node.

annual - - a plant which completes its life cycle, from seed to maturity and death, within one year.

anther - - that part of the stamen, in which the pollen is produced; the anther is usually at the apex of the stamen.

axil - - an angle formed on the upper side by a leaf and the branch or the stem to which the leaf is attached.

axillary - - arising from an axil.

berry - - a few- or many-seeded fleshy fruit which does not spontaneously open even when ripe.

bipinnate - - twice pinnate.

bisexual - - hermaphrodite; flowers having both the male and the female parts.

blade - - the upper broad part of a leaf.

bract - - an appendage or a reduced leaf at the base of a flower or a cluster of flowers.

calyx - - the outer envelope of a typical flower.

capsule - - a dry fruit developed from more than one carpel or ovary, and which normally opens when ripe.

carpel - - a single ovary.

catkin - - a spike of unisexual flowers without calyx or corolla, and with scale-like bracts.

compound - - two or more similar parts forming a whole.

cone - - the fruit of a pine and other members of the family *Coniferae*.

cordate	heart-shaped.
coriaceous	leathery in texture.
corolla	the inner envelope of floral leaves, next to the calyx, usually showy; the constituent parts of this envelope are known as petals, which may be separate or fused together.
corymb	a short, broad and flat-topped inflorescence, the lower or outer flower-stalks being longer than the upper and the lowermost flower being the oldest.
crenate	having a margin scalloped or with rounded teeth.
cyme	a short, broad, flat-topped inflorescence, the lowermost flower being the youngest.
deciduous	shedding leaves seasonally all at one time.
dentate	having a margin with sharp teeth pointing outwards.
digitate	refers to a compound leaf in which the leaflets radiate from the top of the leaf-stalk.
drupe	a fleshy fruit having only one seed enclosed in a hard woody covering.
entire	having a continuous margin, not notched or lobed.
female	a flower having only a pistil but no stamens.
filament	the stalk bearing the anther.
follicle	a many-seeded dry fruit spontaneously opening at maturity only along one margin.
glabrous	smooth, without hairs or any covering.
hirsute	covered with coarse, stiff hairs.
inflorescence	a collection of flowers borne on one parent stalk.
internode	the part of the stem between two nodes.
involucre	a collection of small leaves or bracts at the base of a flower or a cluster of flowers.
latex	the milky sap or juice of a plant.
lanceolate	lance-shaped; tapering at both ends, the broadest part being below the middle.

leaflet - - individual division of a compound leaf.

legume - - a dry, one-celled fruit, opening when ripe along both its margins.

linear - - narrow, with margins almost parallel and much longer than broad.

lobes - - segments formed by the division of the margin of a leaf or any other organ.

male - - flowers having only the stamens but not the pistil.

node - - the joint or the place from where a leaf or a whorl of leaves arises.

nut - - a woody 1-seeded fruit, which does not open spontaneously even when mature; often used for a fruit without a fleshy covering.

obovate - - ovate but with a broad apex and a narrow base.

opposite - - leaves arising from the same node but on opposite sides of the stem.

ovary - - the lower part of the pistil or the female organ of the flower, containing the ovules.

ovate - - egg-shaped with the narrow end upward.

palmate - - having the shape of a palm with the fingers outspread.

panicle - - an open, irregularly branched inflorescence bearing stalked flowers.

perianth - - the floral envelopes of calyx and corolla, especially when both are of the same colour.

petal - - the individual constituent part of a corolla.

persistent - - remaining attached, not falling off.

pinnate - - a compound leaf with the leaflets arranged on either side of the stalk.

pistil - - the female part of the flower, the normal parts of which are ovary, style, and stigma.

pubescent - - softly hairy.

raceme	an elongated, unbranched inflorescence bearing stalked flowers, the youngest flower being at the apex.
rhizome	the root-like underground stem.
root-stock	rhizome.
sepal	the individual constituent part of a calyx.
serrate	having a saw-like margin, the teeth pointing upward.
shrub	a woody plant, the stem, if present, up to about 15 ft. high.
spadix	a fleshy spike bearing numerous small flowers, the inflorescence at first enclosed in a bract.
spathe	the bract covering an inflorescence like a spadix.
spike	an elongated unbranched inflorescence, bearing flowers without stalks; the youngest flower being at the apex.
stamen	the male part of a flower, usually consisting of a filament and anther.
stigma	the part of the pistil which receives the pollen and which is usually at the apex of the pistil.
style	the part of the pistil which is between the ovary and the stigma.
tomentose	densely covered with matted, woolly hairs.
tomentum	a mat of woolly hairs.
umbel	an inflorescence in which a number of stalked flowers arise from the same point, the flower stalks being almost equal in length.
villose	covered with soft long hairs, not matted.
whorl	a circle of leaves, branches, etc., formed round the same node.

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